



Snug Harbor

Preliminary Hydrology Report

Prepared for:
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Newport Beach, CA 92660
949.836.3055

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VP, Engineering
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Date Prepared: 11/5/2024

Project Number: 4206-001

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1.0 INTRODUCTION

1.1 GEOGRAPHIC SETTING

The Snug Harbor project site encompasses a total area of approximately 15.4 acres, and is located at 3100 Irvine Avenue in the City of Newport Beach.

The project site is located at the Newport Beach Golf Course easterly of the intersection of Irvine Avenue and Mesa Drive. The site includes three holes, a driving range, pro shop, clubhouse, sports bar, and an at-grade parking lot. The Orange County Flood Control District (OCFCD) Santa Ana-Delhi Channel and Irvine Avenue border the northerly boundary of the property. Mesa Drive borders the southerly boundary. Commercial properties border the easterly boundary. A Vicinity Map is shown as Figure 1 below.

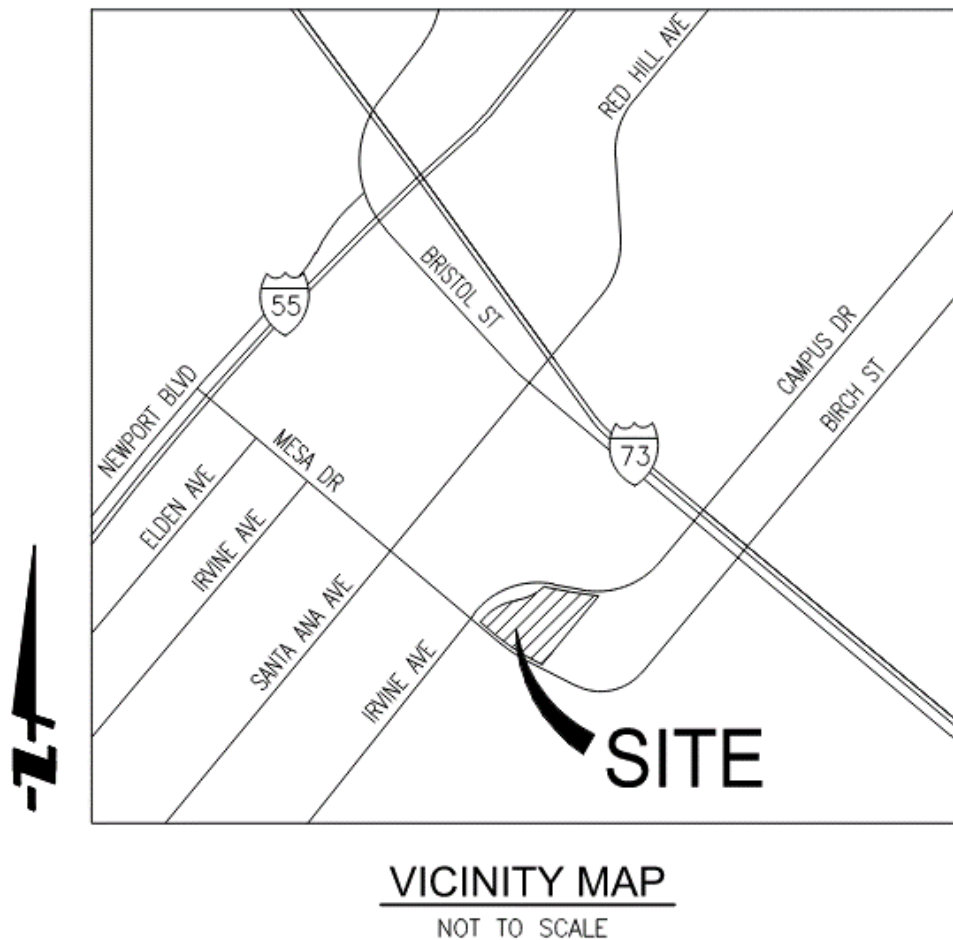


Figure 1

1.2 PROJECT DESCRIPTION

The proposed project development will consist of demolition and removals of existing buildings, parking lot, golf course, and onsite infrastructure. The project will construct a surf park which will include wave lagoons, a clubhouse building, pools, spas, athlete lodging, and parking with solar-power canopies.

1.3 PURPOSE OF THIS REPORT

The purpose of this report is to provide hydrologic and hydraulics calculations and maps for existing and proposed conditions for the proposed project.

1.4 REFERENCES

- Orange County Hydrology Manual
- A.E.S. hydrologic software
- City of Newport Beach GIS
- Orange County Flood Control District (OCFCD) Santa Ana-Delhi As-built Plans
- OCFCD Base Map of Drainage Facilities

2.0 EXISTING DRAINAGE

2.1 EXISTING TOPOGRAPHY

The topography of the site slopes in a northwesterly direction, toward OCFCD's Santa Ana – Delhi Channel and Irvine Avenue. An existing 15- to 20- foot high slope descends from the southeast boundary of the property from about elevation +54 (NAVD88). The remainder of the site generally slopes more gently from an elevation of about +40 (NAVD88) toward the westerly boundary of the project, with elevations approximately +15 to + 20 (NAVD88).

2.2 EXISTING DRAINAGE PATTERN

The existing site is a golf course, with most of the site containing grass and trees, and a portion of the site dedicated to shops and parking. The existing drainage pattern is generally in a westerly direction. There are currently five (5) discharge points; with two points in Irvine Avenue, and three to pipes which are discharged to the Santa Ana – Delhi Channel. From the two discharge points in Irvine Avenue, the drainage is conveyed in the roadway to local catch basins, and is discharged into the Sana Ana – Delhi Channel. The City of Newport Beach's storm drain GIS map, along with OCFCD Base Map of Drainage Facilities, both showing the location of the channel adjacent to the project site, are included in Appendix 1 of this report.

The previously-mentioned Santa Ana – Delhi Channel, owned and maintained by OCFCD, is a 55 feet wide by 16 feet high reinforced-concrete channel that runs in a southerly direction, along the westerly boundary of the site. The as-built channel plans are included in Appendix 2 of this report. The channel currently accepts drainage from the site at three locations, as follows:

- Station 40+79 42-inch (Inv. 11.0 +/- NAVD88)
- Station 44+85 18-inch (Inv. 18.4 +/- NAVD88)
- Station 48+95 18-inch (Inv. 16.7 +/- NAVD88)

There is currently offsite drainage from properties located along the easterly boundary of the golf course. This drainage is conveyed to the golf course via surface gutter or pipes. The drainage is conveyed through the golf course and combines with the onsite drainage and is included with the discharge locations discussed above into the Santa Ana – Delhi Channel.

2.3 OFFSITE TRIBUTARY DRAINAGE

The As mentioned previously, there is offsite tributary drainage from the existing development to the east. The proposed design includes collecting and conveying the offsite drainage through the site, to discharge to the existing channel. The tributary area, approximately 3.9 acres, is shown on the existing condition hydrology map, included in Appendix 3; and the calculations are included in Appendix 4 of this report.

3.0 PROPOSED DRAINAGE

The proposed development will include construction of the surf lagoons, and associated amenities and parking. The proposed onsite drainage will be collected and conveyed through the site, to discharge at the existing locations, with the goal of mimicking existing condition discharge rates. Evaluation of the drainage amount will confirm the need for detention facilities. The lagoon basin area will be self-contained, and will not discharge to the channel. Lastly, water quality BMP's have been designed and located; calculations and worksheets are included in the Preliminary Water Quality Management Plan (PWQMP).

4.0 HYDROLOGIC ANALYSIS

4.1 STORM FREQUENCY

The 25-year and 100-year storm events have been evaluated be used for the existing and proposed conditions. Additionally the 2-year storm event was analyzed to confirm hydromodification requirements.

4.2 METHODOLOGY

This study was prepared in conformance with the Orange County Hydrology Manual. Orange County Rational Method was used. A.E.S. Computer Software was utilized to compile the hydrologic data and to determine the peak discharges. The Soil Type Map is included in Appendix 3. The Existing Condition Hydrology Calculations and Map are included in Appendices 4 and 5, respectively. The Proposed Condition Hydrology Calculations and Map are included in Appendices 6 and 7, respectively.

5.0 FEMA

The site is in Zone X (area of minimal flood hazard), as shown on FIRM Number 06059C0267J effective 12/3/2009. Since the site is not within a Special Flood Hazard Area, as defined by FEMA, a CLOMR/LOMR will not be required. A copy of the Firmette is included in Appendix 8.

6.0 HYDRAULICS ANALYSIS

Hydraulic computations for the online area drain system have been prepared to confirm adequate sizing of the proposed system. The hydraulic calculations are provided, and are included in Appendix 9 of this report.

7.0 RESULTS AND CONCLUSIONS

As discussed in this report, the proposed condition drainage patterns will generally mimic those of the existing condition. The results show that the proposed condition flows do not exceed those of existing condition for the onsite property. The existing and proposed drainage systems have capacities to provide drainage interception and conveyance for the proposed project. The hydrology maps (Appendices 4 and 5) show the

Q2, Q25 and Q100 flow rates at the various discharge locations. The results are tabulated below.

Summary Table: Offsite

SUB AREA	ACRES	Q ₁₀₀ (CFS)	Q ₂₅ (CFS)	Q ₂ (CFS)
OS (Offsite)	3.94	17.2	13.4	6.2

Summary Table: Existing Conditions

SUB AREA	NODE	ACRES	Q ₁₀₀ (CFS)	Q ₂₅ (CFS)	Q ₂ (CFS)
A	13	3.18	10.6	8.0	3.3
B	21	0.09	0.5	0.4	0.2
C	31	0.69	3.2	2.5	1.1
D	43	3.38	11.1	8.6	3.5
E	58	8.09	19.8	14.9	5.8
TOTAL	-	15.43	45.2	34.4	13.9

Summary Table: Proposed Conditions

SUB AREA	NODE	ACRES	Q ₁₀₀ (CFS)	Q ₂₅ (CFS)	Q ₂ (CFS)
A	23	5.03	19.2	15.0	6.8
B	35	1.24	3.8	3.0	1.3
C	55	3.44	16.2	12.6	5.7
D	61	0.19	1.0	0.8	0.3
E (Lagoon)	-	5.53	0.0	0.0	0.0
TOTAL	-	15.43	40.2	31.4	14.1

As discussed previously, the proposed lagoon basins will not discharge to the storm drain system. Therefore, this area is not included in the drainage, and will ultimately discharge to the sanitary sewer system. Due to the 5.5-acre lagoon area not discharging to the storm drain system, the proposed condition discharge rates do not exceed those of the existing condition. Since proposed condition peak flows do not exceed existing condition peak flows, detention mitigation will not be required for this project. Proposed water quality BMP's will be evaluated and designed in accordance with applicable codes. The water quality design is included in the WQMP for this project.

8.0 APPENDICES

<i>Appendix 1</i>	<i>Storm Drain Atlas Maps</i>
<i>Appendix 2</i>	<i>Storm Drain As-Built Plans</i>
<i>Appendix 3</i>	<i>Soil Type Map</i>
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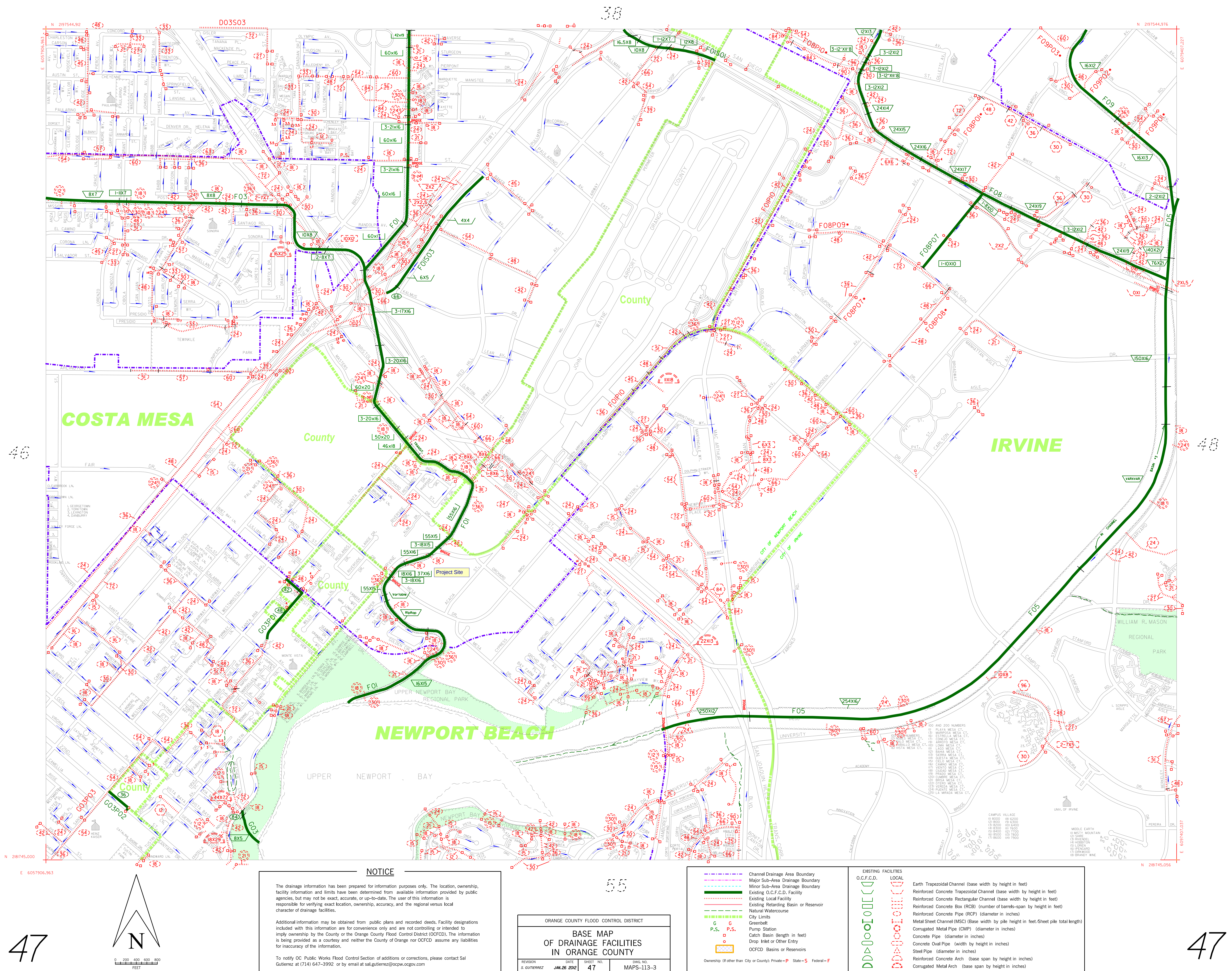
Appendix 1

Storm Drain Atlas Maps



Disclaimer:
Every reasonable effort has been made to assure the accuracy of the data provided, however, The City of Newport Beach and its employees and agents disclaim any and all responsibility from or relating to any results obtained in its use.

8/7/2024



Appendix 2

Storm Drain As-Built Plans

SHEET 1 of 40
FOI-701-11A

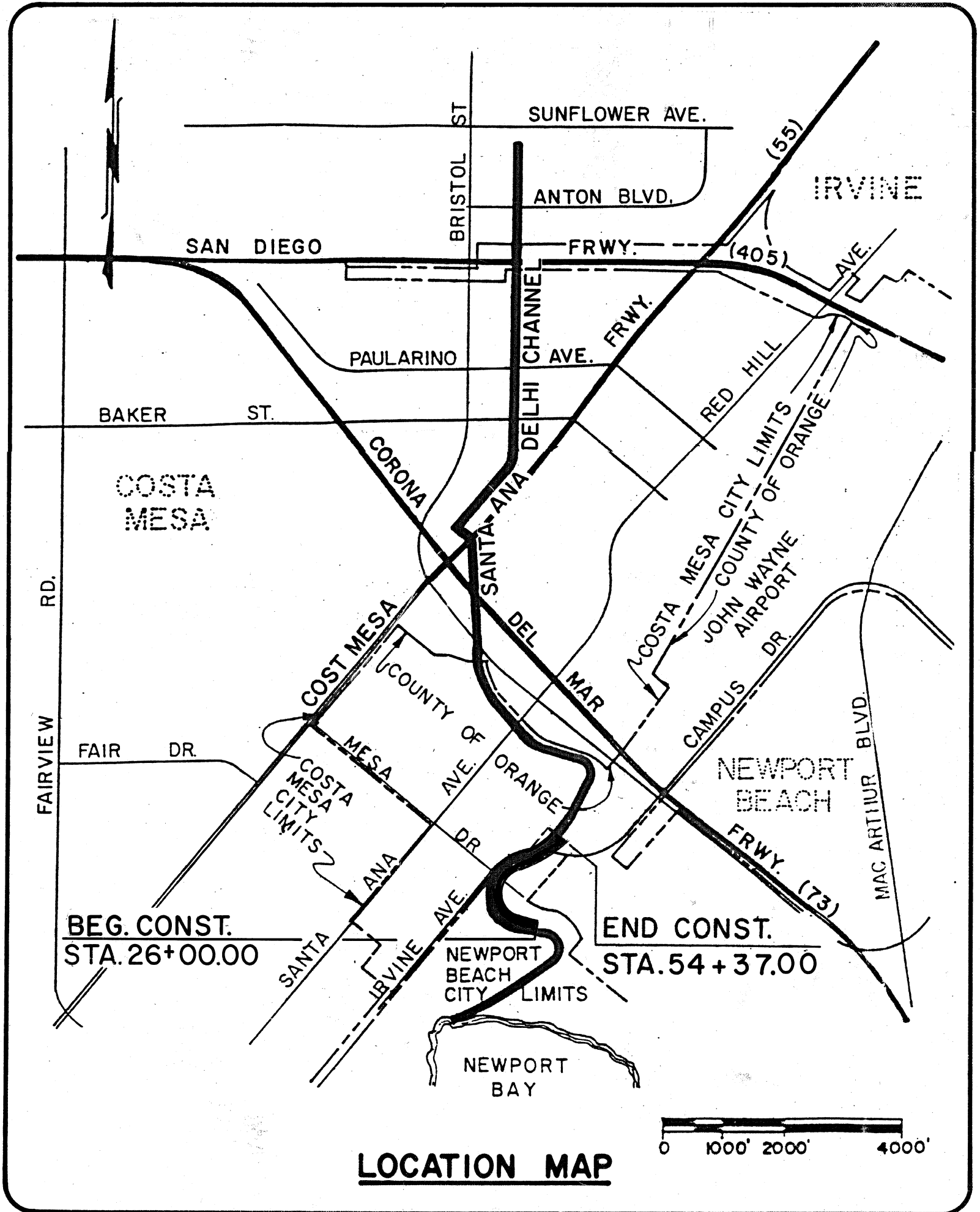
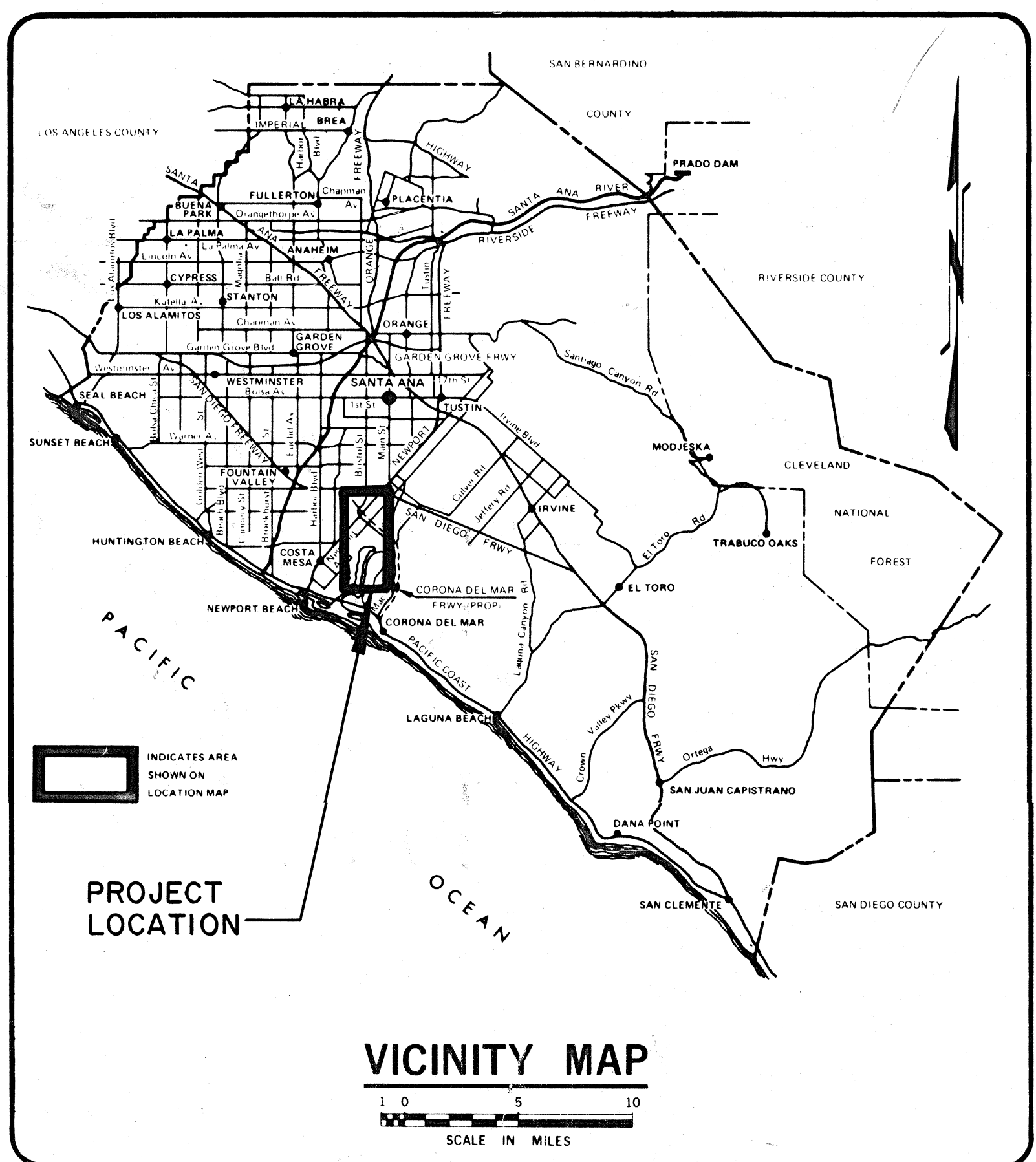
ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY

SANTA ANA, CALIFORNIA

E. SCHNEIDER, DIRECTOR

PLANS FOR CONSTRUCTION OF THAT PORTION OF SANTA ANA - DELHI CHANNEL (FACILITY NO. FOI) FROM

DOWNSTREAM OF MESA DRIVE TO UPSTREAM OF IRVINE AVENUE



INDEX OF SHEETS	
SHEET	DESCRIPTION
1	TITLE SHEET
2	PLAN & PROFILE
3	STA. 26+00.00 TO STA. 37+50.00
4	STA. 37+50.00 TO STA. 43+00.00
5	STA. 43+00.00 TO STA. 48+00.00
6	STA. 48+00.00 TO STA. 54+37.00
7	DETAILS
8	GROUTED RIPRAP, WINGWALL & CUTOFF WALL
9	MESA DRIVE
10	IRVINE AVENUE RECONSTRUCTION
11-12	IRVINE AVENUE DETOUR PAVING
13-14	IRVINE AVE. / MESA DR. CONSTRUCTION SIGNING AND STRIPING DETAILS
15-16	IRVINE AVE. CULVERT PHASE I CONSTRUCTION SIGNING AND STRIPING DETAILS
17	IRVINE AVE. CULVERT PHASE II CONSTRUCTION SIGNING AND STRIPING DETAILS
18	MISCELLANEOUS DETAILS
19	STRUCTURAL
20	STRUCTURAL NOTES & TYPICAL DETAILS
21	R.C. RECTANGULAR CHANNEL SCHEDULE & DETAILS
22	RAMP WALL ELEVATIONS STA. 36+80 TO STA. 39+70
23	MASONRY RETAINING WALL SECTIONS
24	RAMP WALL ELEVATIONS STA. 51+65 TO STA. 53+52.50
25	MASONRY RETAINING WALL ELEVATIONS
26	WALL SECTIONS & DETAILS AT RAMPS
27	R.C. RECTANGULAR CHANNEL & RAMP WALLS "A" & "C" SCHEDULES
28-29	MESA DRIVE BOX CULVERT PLAN
30	MESA DRIVE BOX CULVERT DETAILS
31	IRVINE AVENUE BOX CULVERT PLAN
32	IRVINE AVENUE BOX CULVERT DETAILS
33	IRVINE AVENUE BOX CULVERT TOP & BOTTOM SLAB REINFORCING PLAN
34	R.C. TRANSITION STRUCTURE STA. 35+10 TO STA. 36+40 & MISCELLANEOUS DETAILS
35	PAYLINES
36	SOIL BORINGS
37	UTILITIES
38	S.A. HEIGHTS WATER CO. AT MESA DRIVE
39	CITY OF NEWPORT BEACH, WATER LINE AT IRVINE AVE.
40	MESA DR. SEWER SYPHON UNDER SANTA ANA-DELHI CHANNEL
41	IRVINE AVE. CULVERT PHASE I CONSTRUCTION SIGNING AND STRIPING DETAILS
42	IRVINE AVE. CULVERT PHASE II CONSTRUCTION SIGNING AND STRIPING DETAILS

UTILITY	PHONE NO.
UNDERGROUND SERVICE ALERT	1-800-422-4133
SEWER - COSTA MESA SANITARY DIST.	714-631-1731
SO. CALIFORNIA GAS COMPANY	714-634-3122
PACIFIC BELL TELEPHONE	714-259-4488
SO. CALIFORNIA EDISON COMPANY	714-895-0220
CITY OF NEWPORT BEACH, WATER DIV.	714-644-3011
MESA CONSOLIDATED WATER DIST.	714-631-1291
SANTA ANA HEIGHTS WATER COMPANY	714-545-1060

BENCH MARK: CM-20-70
IN THE S.E. PART OF THE INT. OF IRVINE AVE. AND MESA DR.; 59' S.E. OF THE CENTERLINE OF IRVINE AVE.; 30' S.W. OF THE CENTERLINE OF MESA DR.; 59' S.E. OF THE CENTER OF THE MEDIAN, 0.7' N.E. OF THE S.W. END OF A CONCRETE RETAINING WALL, LEVEL WITH THE SIDEWALK.
ELEVATION: 25.871 FT. - 1976 ADJ.

BASIS OF BEARING:
N49°21'07"W BEING THE CENTERLINE OF MESA DR. EAST AND WEST OF IRVINE AVE. AS PER
RECORD OF SURVEY 85-1012
BK. 110, PG. 39-42

UTILITIES	
APPROVED: _____	DATE _____
FOR CONSTRUCTION OF SANTA ANA HEIGHTS WATER MAIN	
APPROVED: <i>Geffy Starnest</i>	5-4-87
FOR CONSTRUCTION OF CITY OF NEWPORT BEACH WATER MAIN	

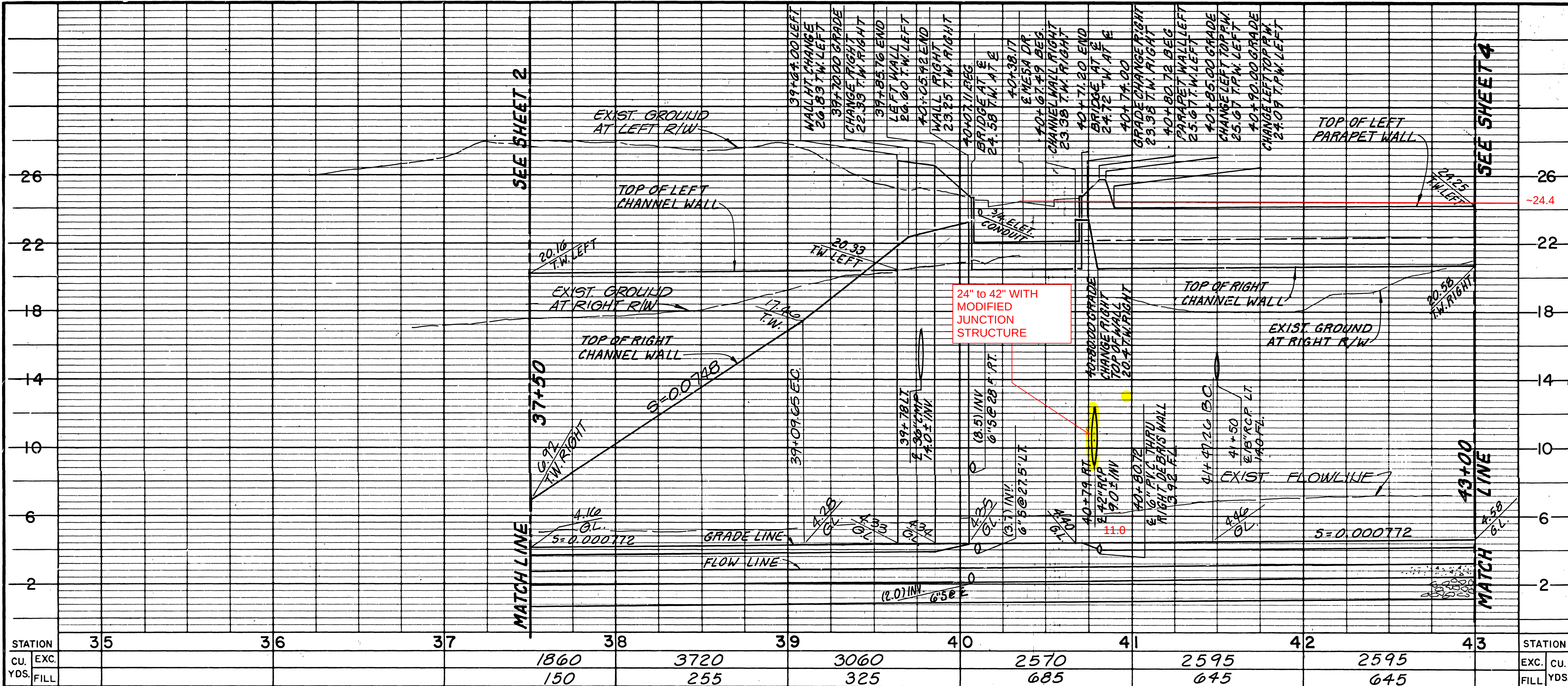
CITY OF NEWPORT BEACH	
FOR PORTION WITHIN CITY OF NEWPORT BEACH	
APPROVED: <i>Robert M. Edmonson</i>	CITY ENGINEER
APPROVED: <i>Richard M. Edmonson</i>	TRAFFIC ENGINEER
APPROVED FOR CONCEPT & ADHERENCE TO CITY STDs. & REQUIREMENTS ONLY. CITY IS NOT RESPONSIBLE FOR DESIGN ASSUMPTION & ACCURACY.	

APRIL, 1987 **AS BUILT**
CONTRACTOR : KIENIT PACIFIC CO.
INSPECTOR : G.D. EVANS
R.C.E. : O.N. MARSHALL
COMPLETED : OCT. 1988
MAINTAINED BY: O.C.F.C.D.
FUNDED BY: O.C.F.C.D.

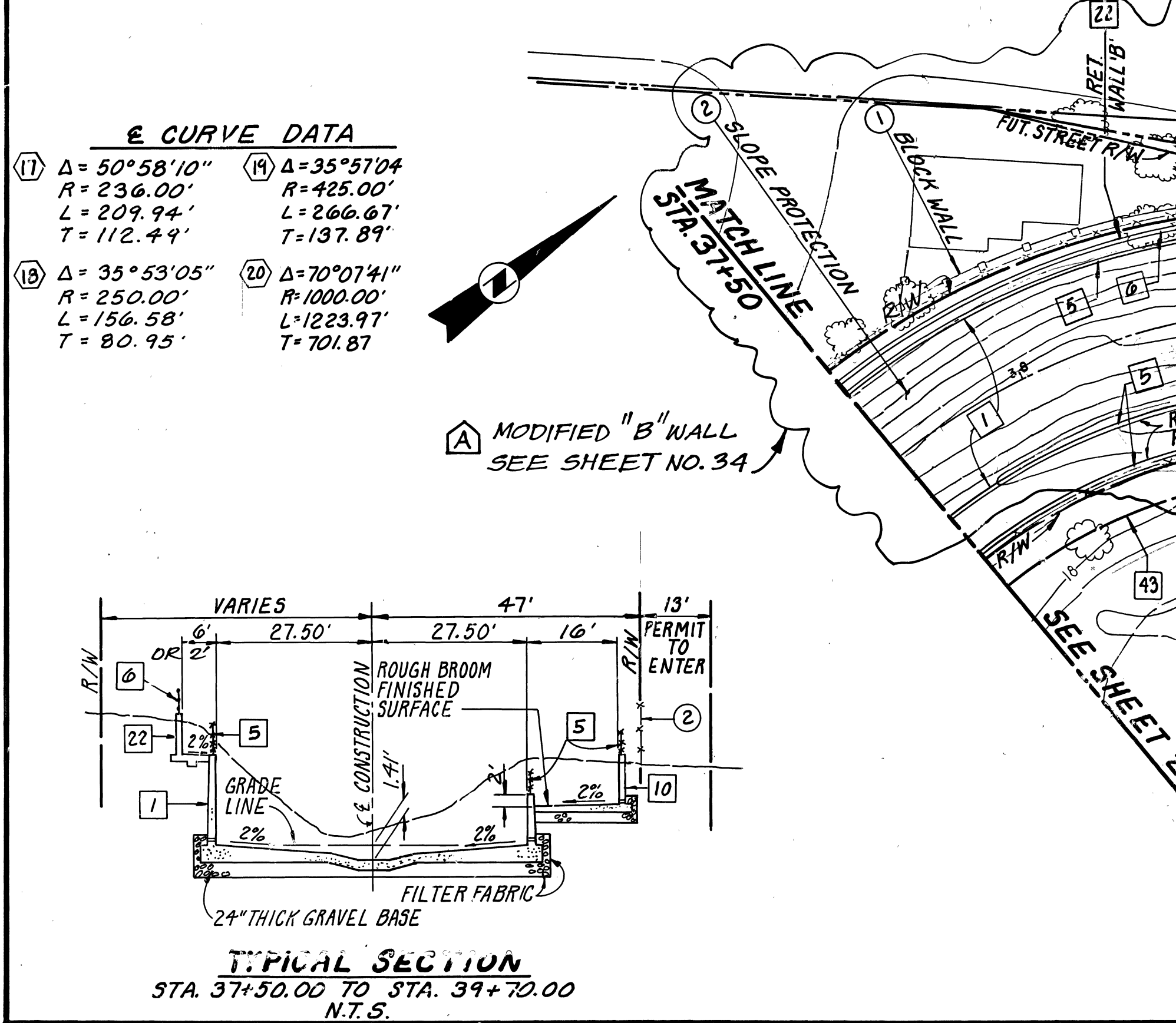
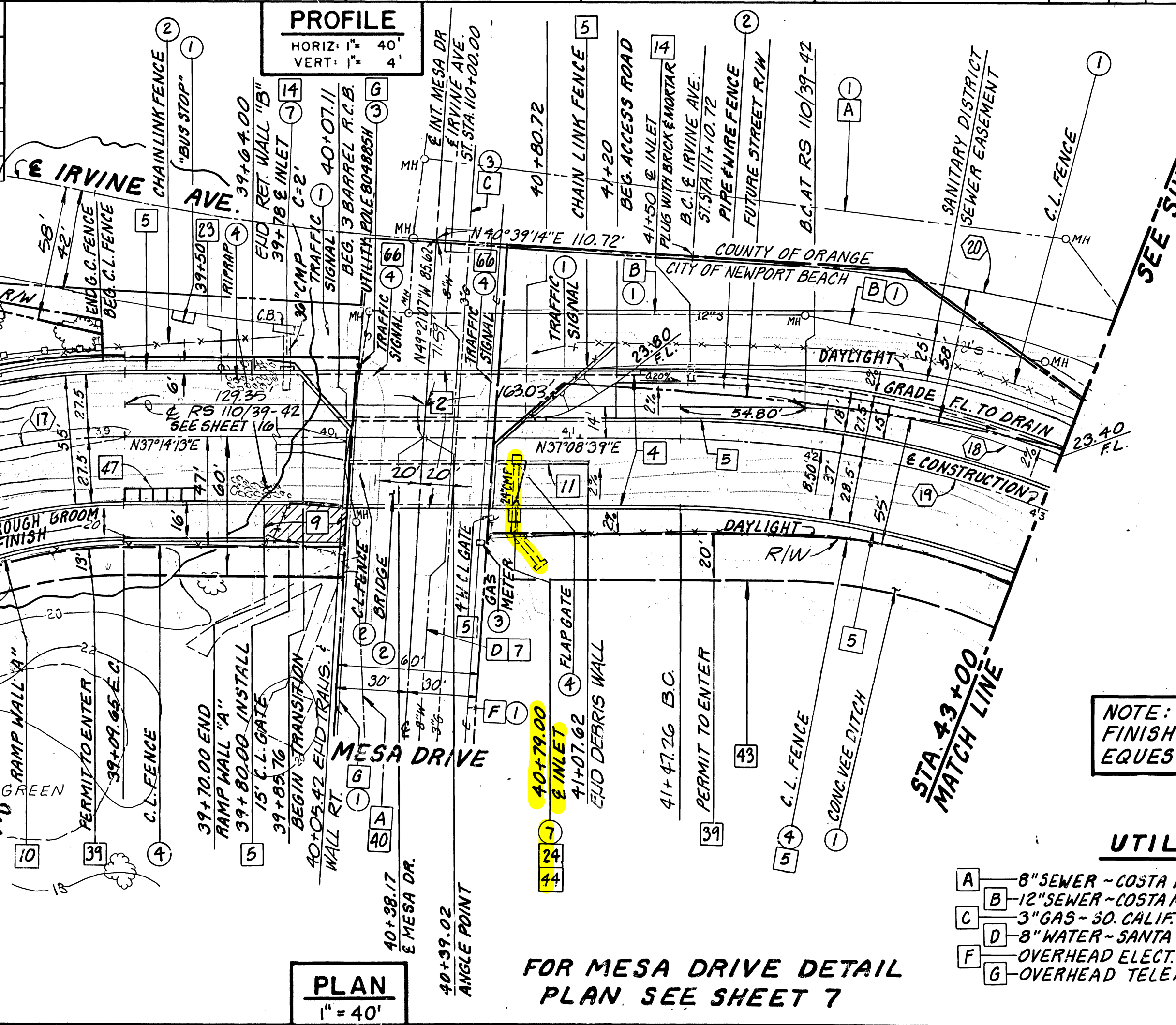
EMA-PUBLIC WORKS	
SUBMITTED: <i>James D. Williams</i>	EXP. 12-31-89
RECOMMENDED: <i>James D. Williams</i>	EXP. 12-31-89
APPROVED: <i>James D. Williams</i>	EXP. 12-31-89
APPROVED FOR CONCEPT & ADHERENCE TO CITY STDs. & REQUIREMENTS ONLY. CITY IS NOT RESPONSIBLE FOR DESIGN ASSUMPTION & ACCURACY.	

PREPARED BY:	BSI CONSULTANTS, INC.
1415 East Seventeenth St. Santa Ana, CA 92701 (714) 538-1892	
PREPARED UNDER THE SUPERVISION OF:	<i>James D. Williams</i>
RCE 26879 (EXP. 3-31-89)	

NO.	AS BUILT	DESCRIPTION	ALL	SHIT.	APPROVED	DATE
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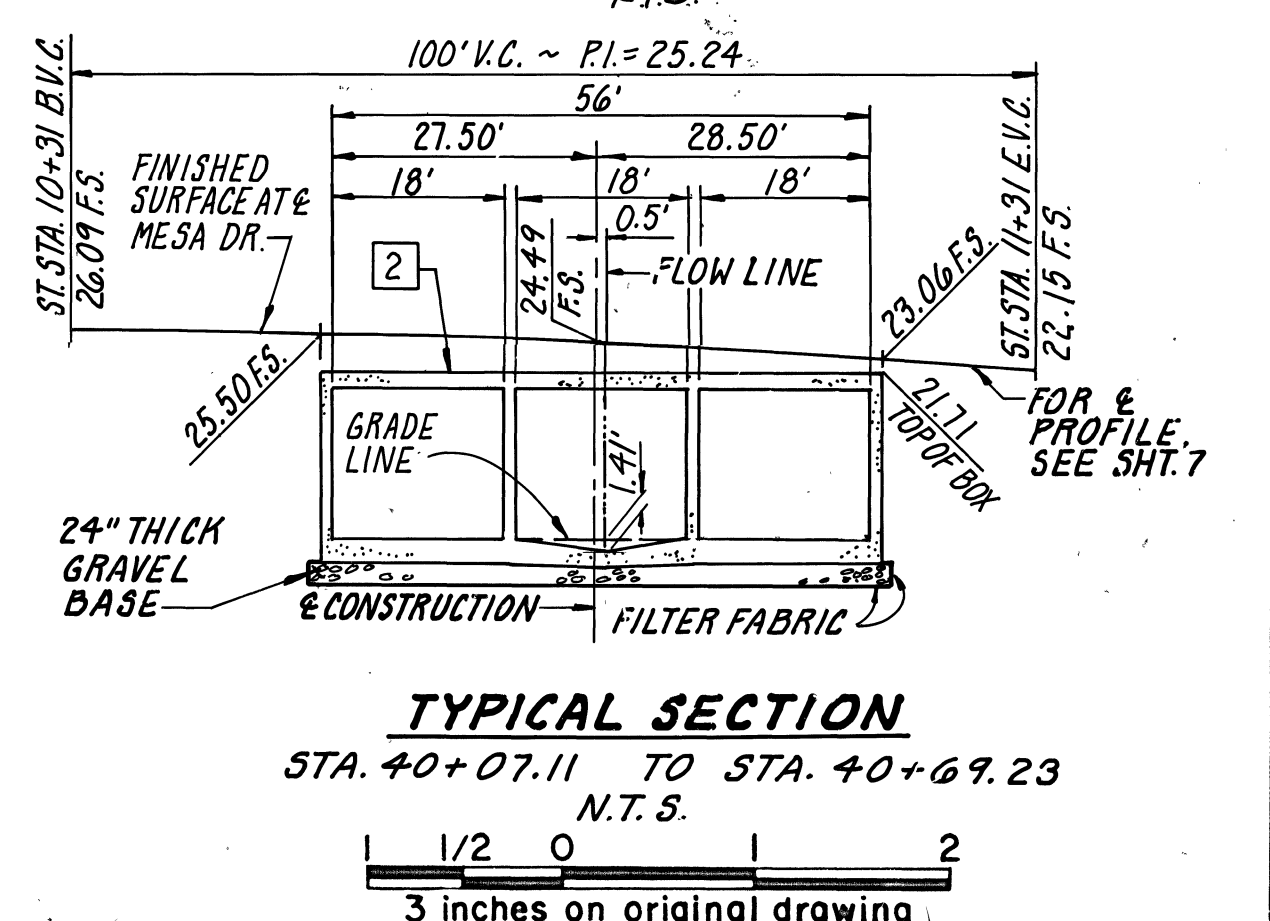
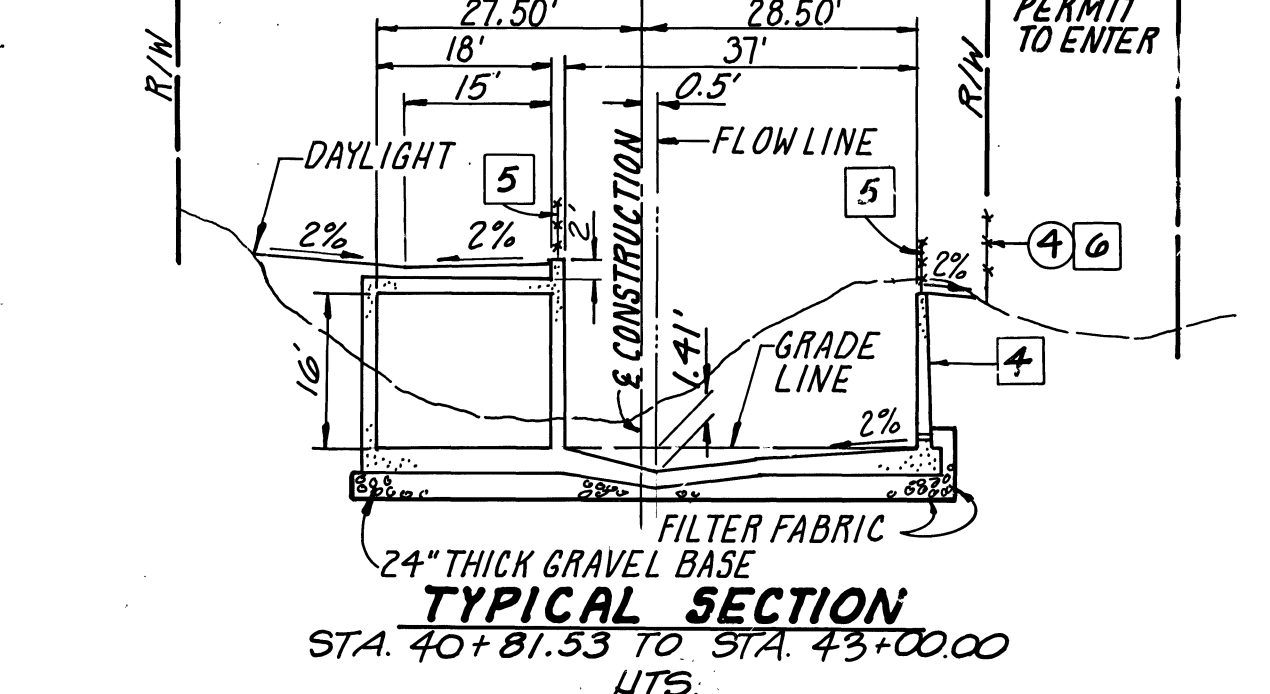
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					Dn	Vn		Dn	Vn		
37+50.00 - 39+85.76	8550	55'	0	0.000772	12.54'	12.39	0.62	13.75'	11.30	0.54	9.09
40+07.11 - 43+00.00	2327	18'	0	0.000772	14.18'	9.20	0.43	15.67'	8.25	0.37	8.04
40+07.11 - 40+71.20	3112	2x18	0	0.000772	17.80	9.71	0.41	19.87	8.70	0.34	9.76
40+71.20 - 43+00.00	6223	37'	0	0.000772	14.18	11.82	0.55	15.67	10.73	0.48	9.58



- ### CONSTRUCTION NOTES
- CONSTRUCT R.C. RECT. CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION AND PER STRUCTURAL DETAILS ON SHEET 18.
 - CONSTRUCT R.C. BOX PER PLAN AND PROFILE AND PER STRUCTURAL DETAILS ON SHEET 25 (MESA DR.).
 - CONSTRUCT R.C. BOX AND RECT. CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION AND PER STRUCTURAL DETAILS ON SHEET 25.
 - CONSTRUCT 5" C.I. FENCE AND/OR GATE PER PLAN AND TYPICAL SECTION AND PER STD. PLAN 14/2.
 - CONSTRUCT GUARD CABLE FENCE PER PLAN AND TYPICAL SECTIONS AND PER STD. PLAN 14/3.
 - REMOVE AND RECONSTRUCT 8" STL. WATER MAIN PER SHEET 36.
 - CONSTRUCT 3" ASPHALT CONCRETE PAVEMENT WITH TACK COAT PER PLANS AND TYPICAL SECTIONS.
 - CONSTRUCT ACCESS RAMP WALL "A" PER DETAILS ON SHEET 19.
 - CONSTRUCT DEBRIS WALL PER DETAILS ON SHTS. 26 & 27.
 - CONSTRUCT JUNCTION STRUCTURE TYPE V PER PLAN AND PROFILE AND PER STD. PLAN 13/4.
 - CONSTRUCT CONCRETE BLOCK RETAINING WALL "B" PER PLAN AND PROFILE AND PER DETAILS ON SHEETS 19 & 30.
 - CONSTRUCT DRAINAGE GROOVE PER DETAIL ON SH. 15.
 - CONSTRUCT CURB AND GUTTER, TYPE A-2, PER PLAN AND PER STD. PLAN 104-O-0C.
 - CONSTRUCT P.C. C. SIDEWALK PER PLAN AND PER STD. PLAN 1205.
 - CONSTRUCT 5" C.F. CURB PER STD. PLAN 104-O-0C, TYPE C1-5 (C1-6 MODIFIED).
 - CONSTRUCT 0.85 ASPHALT CONCRETE OVER NATIVE SOIL OR 0.35 ASPHALT CONCRETE OVER 1" 0" AGGREGATE BASE.
 - CONSTRUCT VARIABLE THICKNESS ASPHALT CONCRETE.
 - REPAIR LANDSCAPING AND CONCRETE DITCH DAMAGED WITHIN CONSTRUCTION AREA.
 - REMOVE AND RECONSTRUCT 8" V.C.P. SEWER SYPHON PER SHEET 38.
 - CONSTRUCT MODIFIED JUNCTION STRUCTURE TYPE V WITH AUTOMATIC FLAP GATE PER STD. PLAN 13/4 AND PER DETAIL ON SHEET 15.
 - CONSTRUCT EQUESTRIAN TRAIL TEST BINS PER DETAILS ON SHEET 16.
 - INSTALL AND REMOVE TEMPORARY CHAIN LINK FENCE.
 - CONSTRUCT GAGING STATION CONDUIT PER DETAILS ON SHEET 16.
 - REINSTALL SALVAGED TRAFFIC SIGNALS AND PULLBOXES PER SHEET 10.

- ### LEGEND
- PROTECT IN PLACE
 - REMOVE
 - TO BE RELOCATED BY OWNER
 - REMOVE AND SALVAGE
 - REMOVE TO 12" MIN. BELOW SUB-GRADE
 - REMOVE INTERFERING PORTION OF EXISTING PIPE AND OUTLET STRUCTURE.

PER SURVEY CREST IN CENTER OF ROAD ABOVE CHANNEL AT MESA AVE IS -26.4'. THEREFORE ADJUSTMENT IS ELEVATION ON THIS PLAN SHEET +2.0' TO MATCH OUR PLANS.



NOTE: PRESENT CHANNEL INVERT FINISH IS NOT APPROPRIATE FOR EQUESTRIAN ACCESS.

UTILITIES

- 8" SEWER - COSTA MESA SANITARY DISTRICT
- 12" SEWER - COSTA MESA SANITARY DISTRICT
- 3" GAS - 30. CALIF. GAS CO.
- 8" WATER - SANTA ANA HEIGHTS WATER CO.
- OVERHEAD ELECT. - 30. CALIF. EDISON CO.
- OVERHEAD TELEPHONE - PACIFIC BELL TELEPHONE

ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY

SANTA ANA-DELHI CHANNEL (FOI)

PLAN AND PROFILE

STA. 37+50.00 TO STA. 43+00.00

REGISTERED PROFESSIONAL ENGINEER

C 26879

Exp. 3-31-89

CIVIL

STATE OF CALIFORNIA

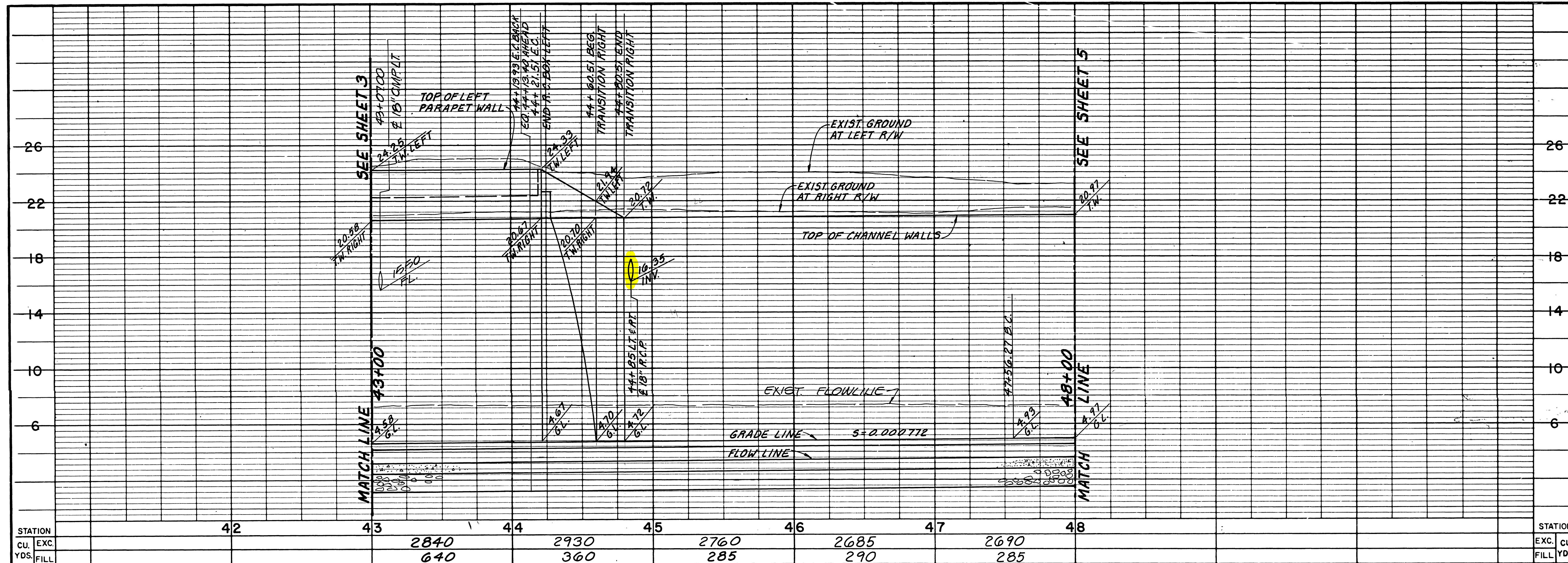
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DESIGNED	AWM	REVISIONS	RCE 26879	DATE	3
DRAWN	HCC, MSB	CHECKED	VJC	AS SHOWN	APR 1987

SCALE: AS SHOWN

DATE: APR 1987

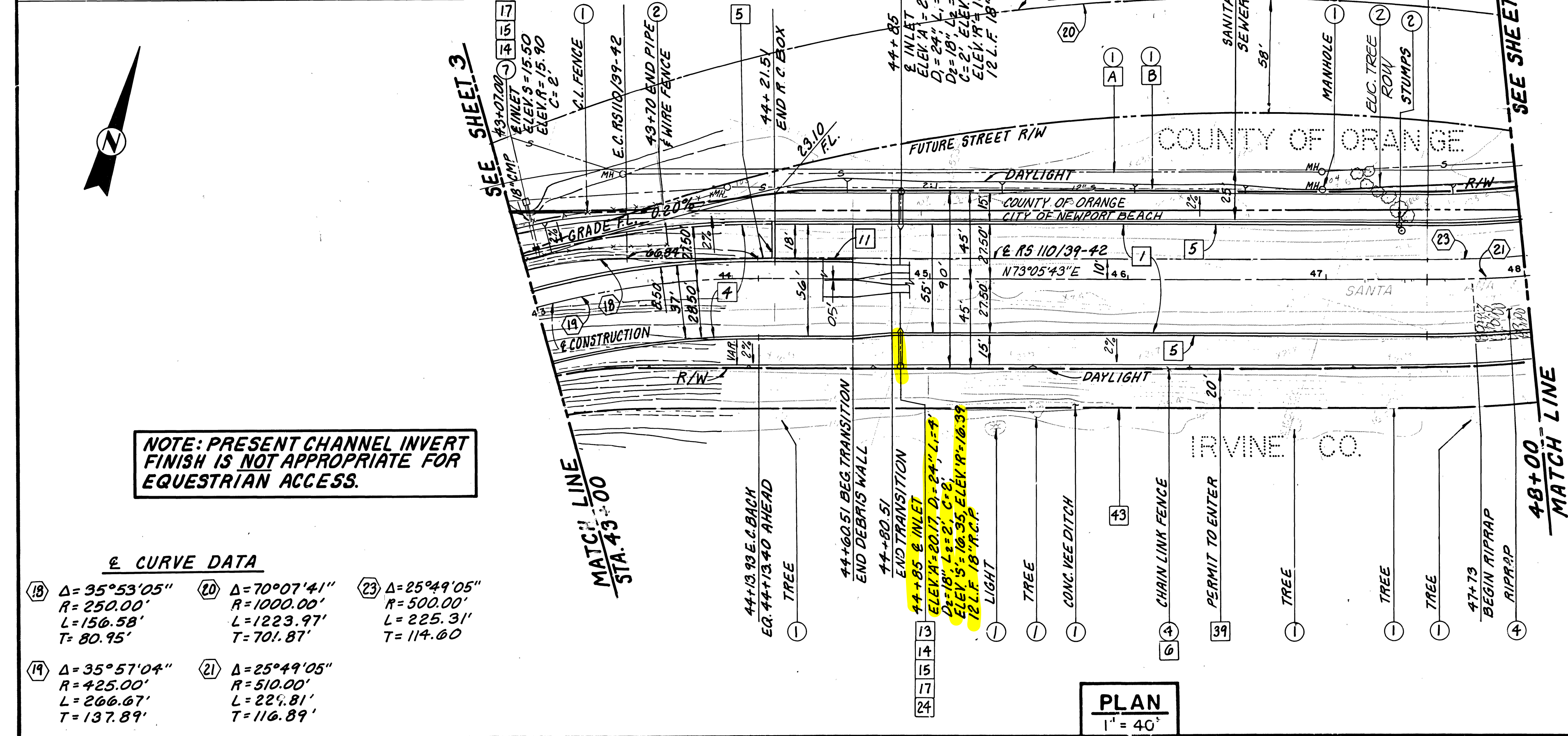
DWG. NO.: FOI-701-11A

OF 40



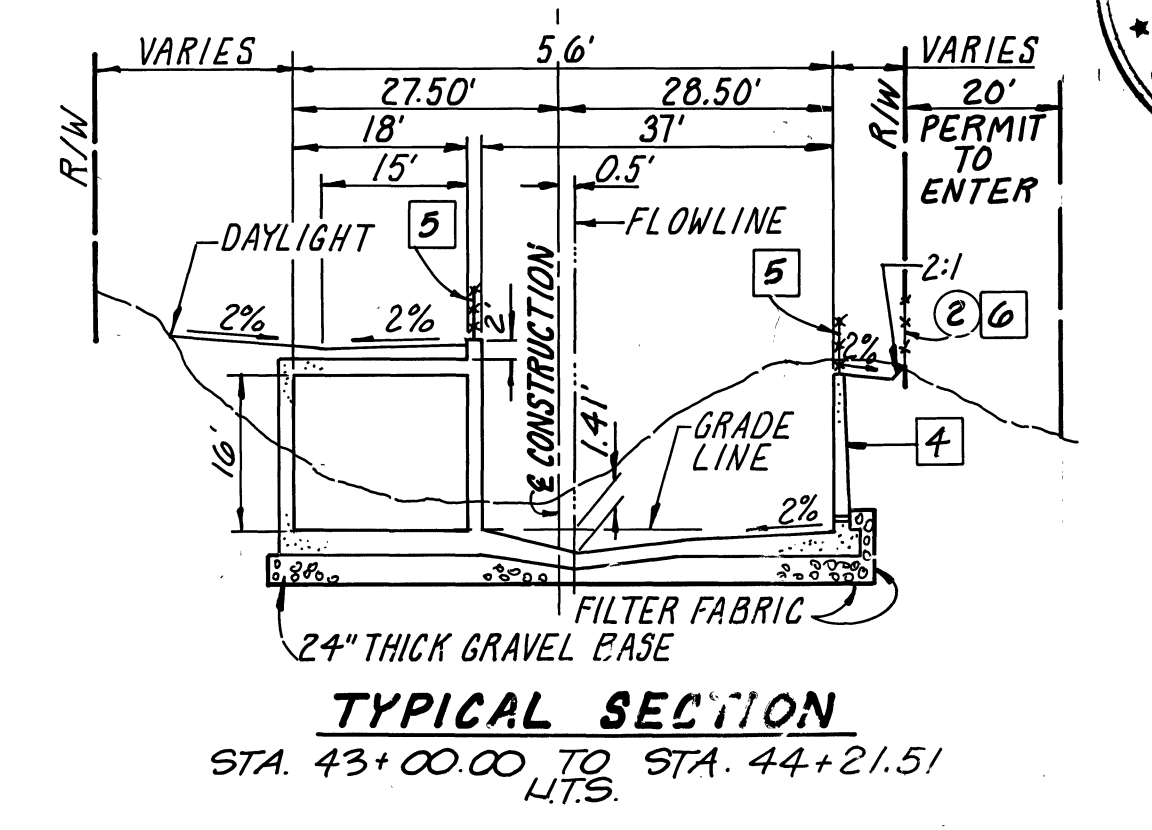
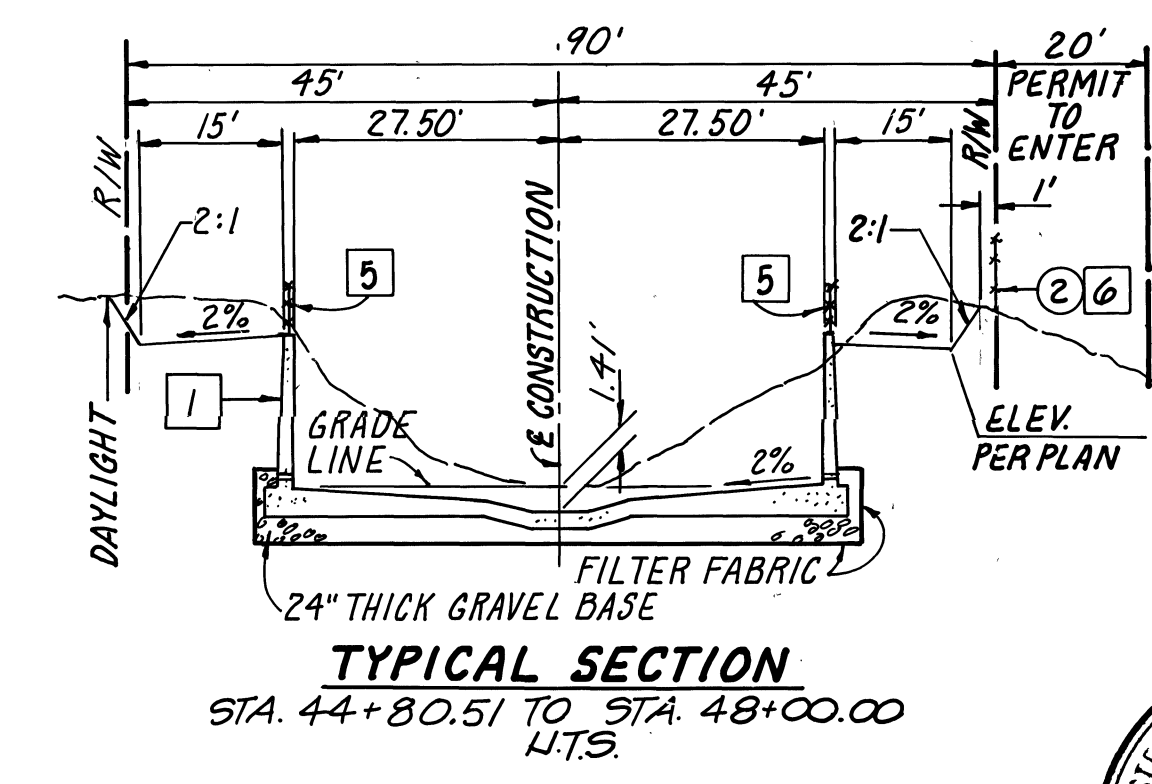
HYDRAULIC DATA											
STATION TO STATION		Q	b	z	S	n=0.014		F	n=0.016		Dc
						Dn	Vn		Dn	Vn	
43+00.00 ~ 44+17.07		2327	18'	0	0.000772	14.18'	9.20	0.43	15.67'	8.25	0.37
43+00.00 ~ 44+17.07		6223	37'	0	0.000772	14.18'	11.82	0.55	15.67'	10.73	0.48
44+17.07 ~ 48+00.00		8550	55'	0	0.000772	12.54	12.39	0.62	13.75'	11.30	0.54

PROFILE	
HORIZ. 1" = 40'	
VERT. 1" = 4'	

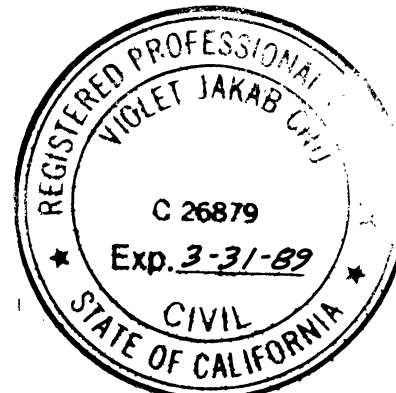


NOTE: PRESENT CHANNEL INVERT FINISH IS NOT APPROPRIATE FOR EQUESTRIAN ACCESS.

CURVE DATA		
(18) Δ=35°53'05"	(20) Δ=70°07'41"	(23) Δ=25°49'05"
R=250.00'	R=1000.00'	R=500.00'
L=156.58'	L=1223.97'	L=225.31'
T=80.95'	T=701.87'	T=114.60'
(19) Δ=35°57'04"	(21) Δ=25°49'05"	
R=425.00'	R=510.00'	
L=266.67'	L=224.81'	
T=137.89'	T=116.89'	



- ### CONSTRUCTION NOTES
- CONSTRUCT R.C. RECT. CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION AND PER STRUCTURAL DETAILS ON SHEET 18.
 - CONSTRUCT R.C. BOX AND RECT. CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION AND PER STRUCTURAL DETAILS ON SHEET 25.
 - CONSTRUCT 5' C.L. FENCE AND/OR GATE PER PLAN AND TYPICAL SECTION AND PER STD. PLAN 1412.
 - CONSTRUCT GUARD CABLE FENCE PER PLAN AND TYPICAL SECTIONS AND PER STD. PLAN 1413.
 - CONSTRUCT DEBRIS WALL PER DETAILS ON SHTS. 26 & 27.
 - CONSTRUCT INLET TYPE V PER PLAN AND PER STD. PLAN 1305.
 - CONSTRUCT JUNCTION STRUCTURE TYPE V PER PLAN AND PROFILE AND PER STD. PLAN 1314.
 - INSTALL 18" R.C.P. 2000-D BEDDING PER STD. PLAN 1319.
 - CONSTRUCT REINFORCED CONCRETE COLLAR PER STD. PLAN 1317.
 - CONSTRUCT DRAINAGE GROOVE PER DETAIL ON SHT. 15.
 - REPAIR LANDSCAPING AND CONCRETE DITCH DAMAGED WITHIN CONSTRUCTION AREA.
 - INSTALL AND REMOVE TEMPORARY CHAIN LINK FENCE.
- ### LEGEND
- PROTECT IN PLACE.
 - REMOVE.
 - REMOVE AND SALVAGE.
 - REMOVE INTERFERING PORTION OF EXISTING PIPE AND OUTLET STRUCTURE.
- ### UTILITIES
- A 8" SEWER-COSTA MESA SANITARY DISTRICT
B 12" SEWER-COSTA MESA SANITARY DISTRICT



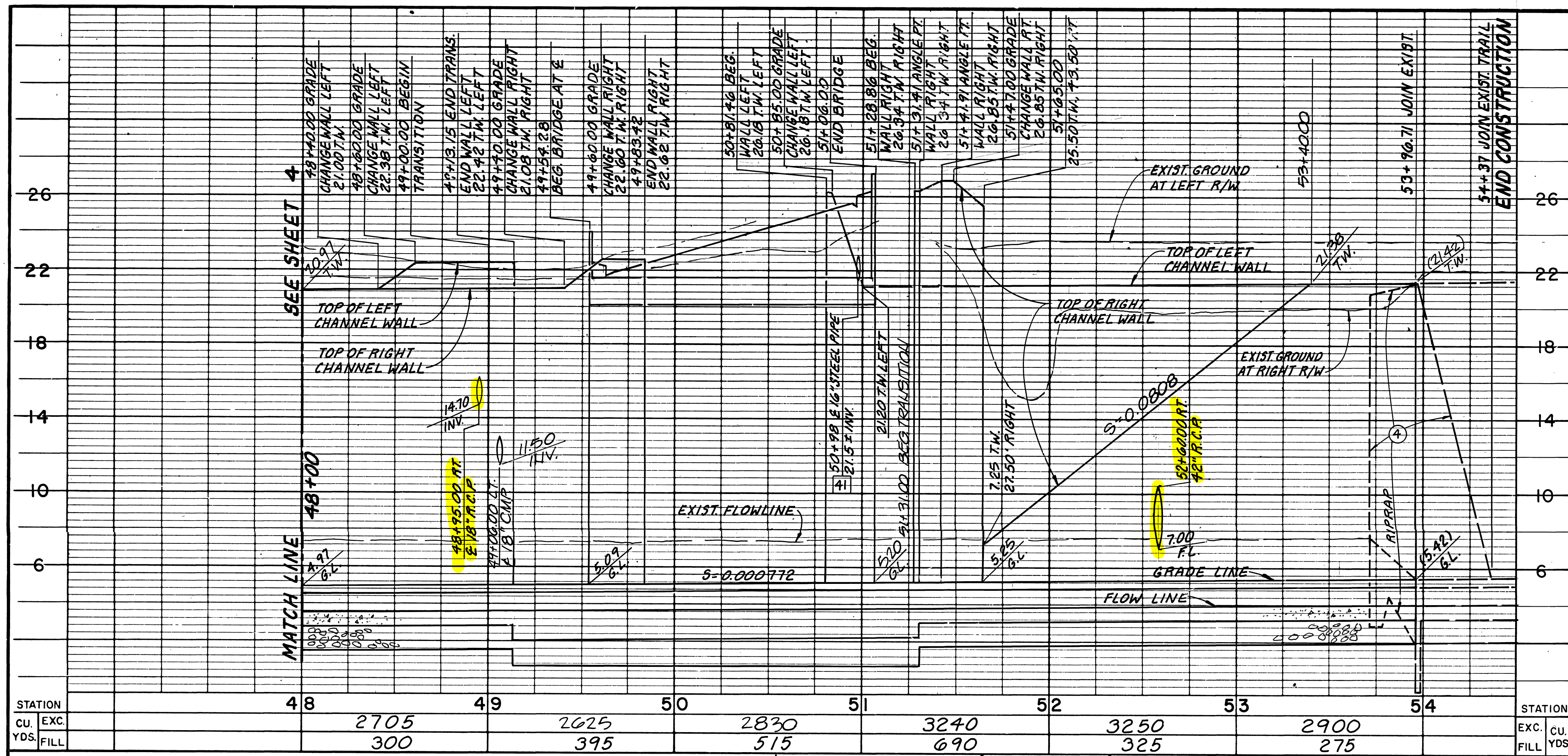
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3 inches on original drawing

ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY			
SANTA ANA-DELHI CHANNEL (FOI)			
PLAN AND PROFILE			
STA. 43+00.00 TO STA. 48+00.00			
MARK	DATE	DESCRIPTION	PREPARED UNDER SUPERVISION OF
REVISIONS		SCALE	DATE
DESIGNED: HCC		DATE	DWG. NO.
DRAWN: HCC, MSB		CHECKED: VJC	DATE
		AS SHOWN	APR 1987
		FOI-701-11A	OF 40

FOI-701-11A

40

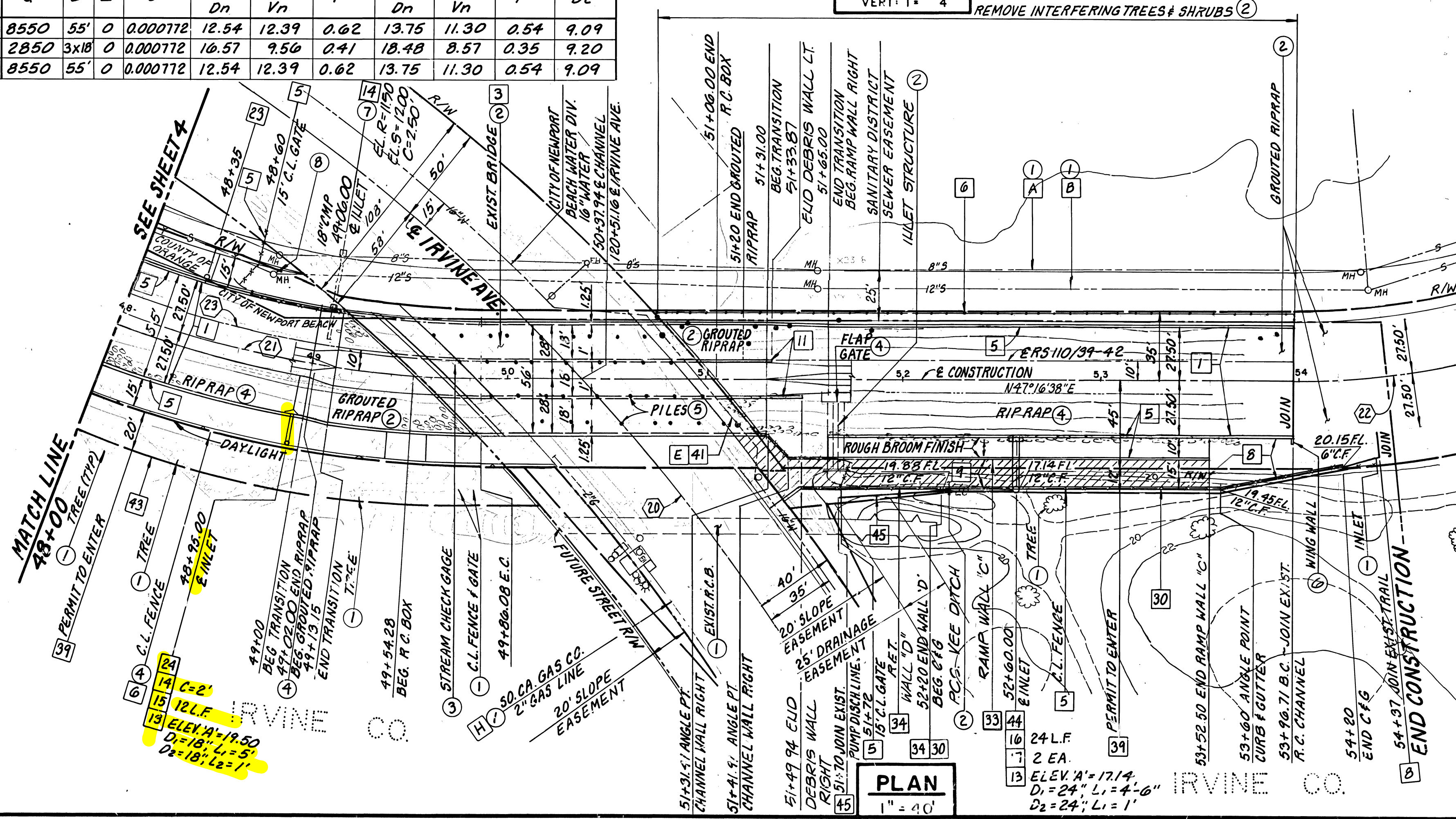
5



HYDRAULIC DATA									
STATION TO STATION	Q	b	z	S	n=0.014		F	n=0.016	
					Dn	Vn		Dn	Vn
48+00.00 ~ 49+00.00	8550	55'	0	0.000772	12.54	12.39	0.62	13.75	11.30
49+54.28 ~ 50+00.00	2850	3x18	0	0.000772	10.57	9.56	0.41	18.48	8.57
51+31.00 ~ 53+96.71	8550	55'	0	0.000772	12.54	12.39	0.62	13.75	11.30

PROFILE	
HORIZ. 1" = 40'	
VERT. 1" = 4'	

- ε CURVE DATA**
- (10) Δ=70°07'41"
R=1000.00'
L=1223.97'
T=701.87'
 - (11) Δ=25°49'05"
R=510.00'
L=229.81'
T=116.89'
 - (12) Δ=20°17'20"
R=410.00'
L=145.18'
T=73.36'
 - (13) Δ=25°49'05"
R=500.00'
L=225.31'
T=114.60'



CONSTRUCTION NOTES

- CONSTRUCT R.C. RECT. CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION AND PER STRUCTURAL DETAILS ON SHT. 18.
- CONSTRUCT R.C. BOX PER PLAN AND PROFILE AND PER STRUCTURAL DETAILS ON SHT. 27.
- CONSTRUCT 5" C.L. FENCE AND/OR GATE PER PLAN AND TYPICAL SECTION AND PER STD. PLAN 1412.
- CONSTRUCT GUARD CABLE FENCE PER PLAN AND TYPICAL SECTIONS AND PER STD. PLAN 1413.
- CONSTRUCT 8" THICK DECOMPOSED GRANITE SERVICE ROAD / EQUESTRIAN TRAIL PER PLANS AND TYPICAL SECTIONS.
- CONSTRUCT 3" ASPHALT CONCRETE PAVEMENT WITH TACK COAT PER PLANS AND TYPICAL SECTIONS.
- CONSTRUCT DEBRIS WALL PER DETAILS ON SHTS. 26 & 27.
- CONSTRUCT INLET TYPE V PER PLAN AND PER STD. PLAN 1305.
- CONSTRUCT JUNCTION STRUCTURE TYPE V PER PLAN AND PROFILE AND PER STD. PLAN 1314.
- INSTALL 24" R.C.P. 2000-D, BEDDING PER STD. PLAN 1319.
- CONSTRUCT REINFORCED CONCRETE COLLAR PER STD. PLAN 1317.
- CONSTRUCT MODIFIED CURB AND GUTTER TYPE A2 PER STD. PLAN 104-D-00. CURB FACE VARIES 6" TO 12". W=1'-6".
- CONSTRUCT ACCESS RAMP WALL 6" PER DETAILS ON SHT. 20.
- CONSTRUCT CONCRETE BLOCK RETAINING WALL 'D' PER PLAN AND PROFILE AND PER DETAILS ON SHT. 20.
- REPAIR LANDSCAPING AND CONCRETE DITCH DAMAGED WITH CONSTRUCTION AREA.
- REMOVE 16" AND CONSTRUCT 24" STL. WATER MAIN PER SHT. 37. INSTALL AND REMOVE TEMPORARY CHAIN LINK FENCE.
- CONSTRUCT MODIFIED JUNCTION STRUCTURE TYPE V WITH AUTOMATIC FLAP GATE PER STD. PLAN 1314 AND PER DETAIL ON SHEET 15.
- INSTALL 2" STL. PIPE SCH. 40, 1/2" FITTINGS.
- CONSTRUCT GAGING STATION CONDUIT PER DETAILS ON SHT. 16.

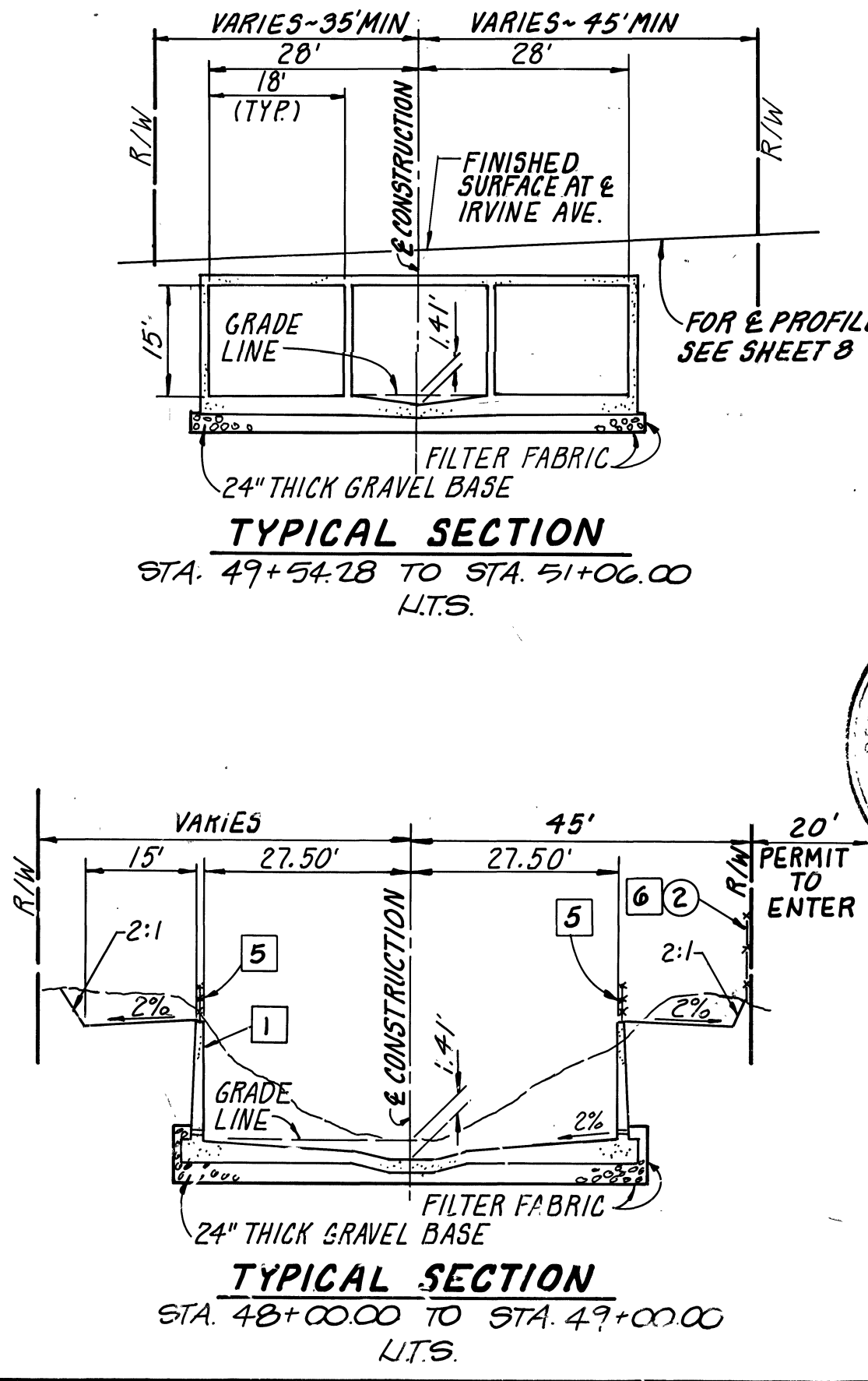
LEGEND

- PROTECT IN PLACE.
- REMOVE.
- REMOVE AND SALVAGE.
- REMOVE TO 12" MIN. BELOW SUB-GRADE.
- REMOVE WINGWALL TO CHANNEL WALL. BURN OFF REBARS TO 1" BELOW FACE. FILL HOLES WITH EPOXY AND FINISH TO SATISFACTION OF THE ENGINEER.
- REMOVE INTERFERING PORTION OF EXISTING PIPE AND OUTLET STRUCTURE.
- ADJUST TO GRADE.
- TO BE RELOCATED BY OWNER.

UTILITIES

A 8" SEWER ~ COSTA MESA SANITARY DISTRICT
B 12" SEWER ~ COSTA MESA SANITARY DISTRICT
E 16" WATER ~ CITY OF NEWPORT BEACH, WATER DIV.
H 2" GAS ~ SO. CALIF. GAS CO.

NOTE: PRESENT CHANNEL INVERT FINISH IS NOT APPROPRIATE FOR EQUESTRIAN ACCESS.



TYPICAL SECTION
STA. 49+54.28 TO STA. 51+06.00
LTS.

TYPICAL SECTION
STA. 51+06.00 TO STA. 53+52.50
LTS.

TYPICAL SECTION
STA. 48+00.00 TO STA. 49+00.00
LTS.

ORANGE COUNTY
ENVIRONMENTAL MANAGEMENT AGENCY

SANTA ANA-DELHI CHANNEL (FOI)

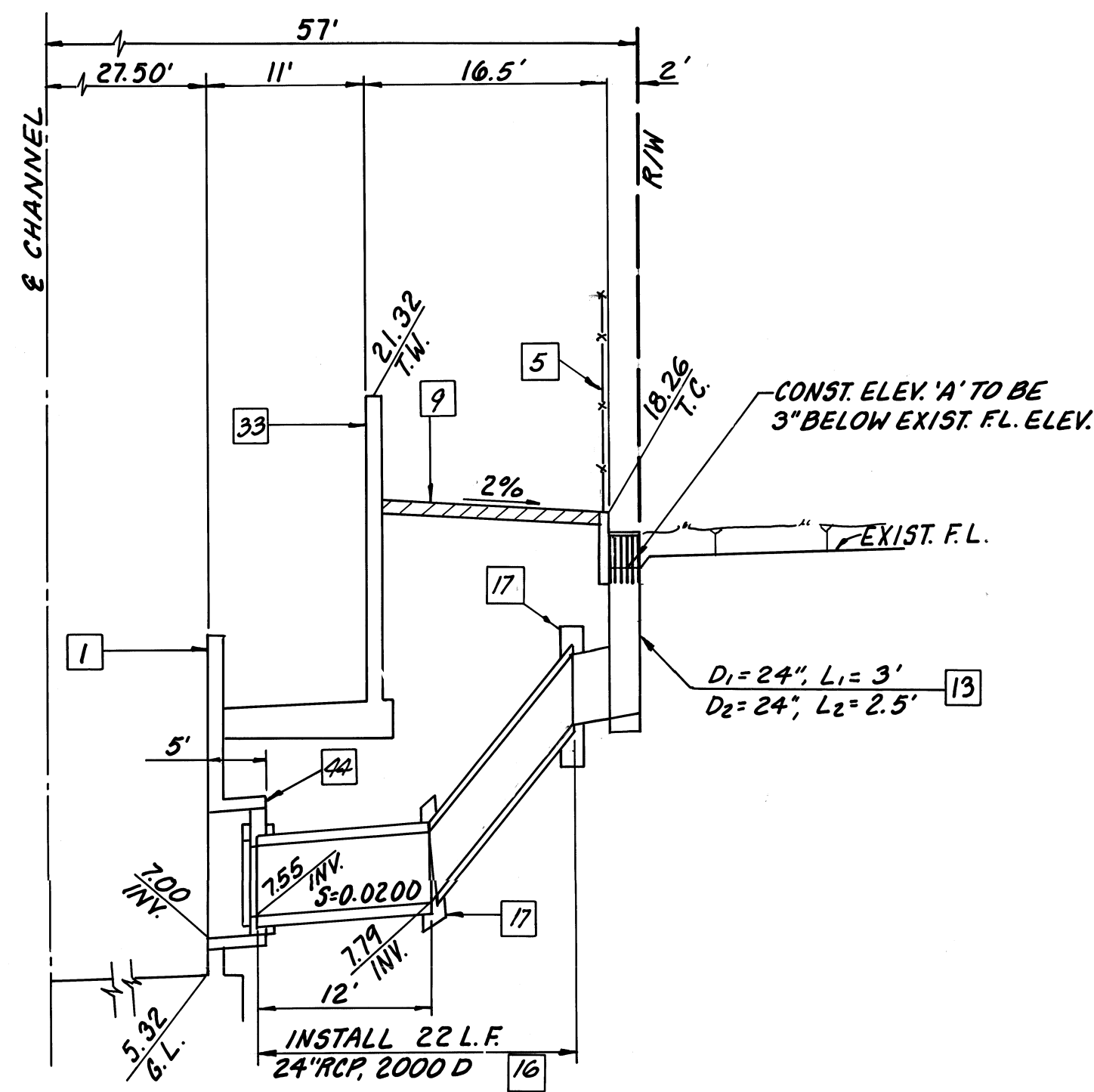
PLAN AND PROFILE

STA. 48+00.00 TO STA. 54+37.00

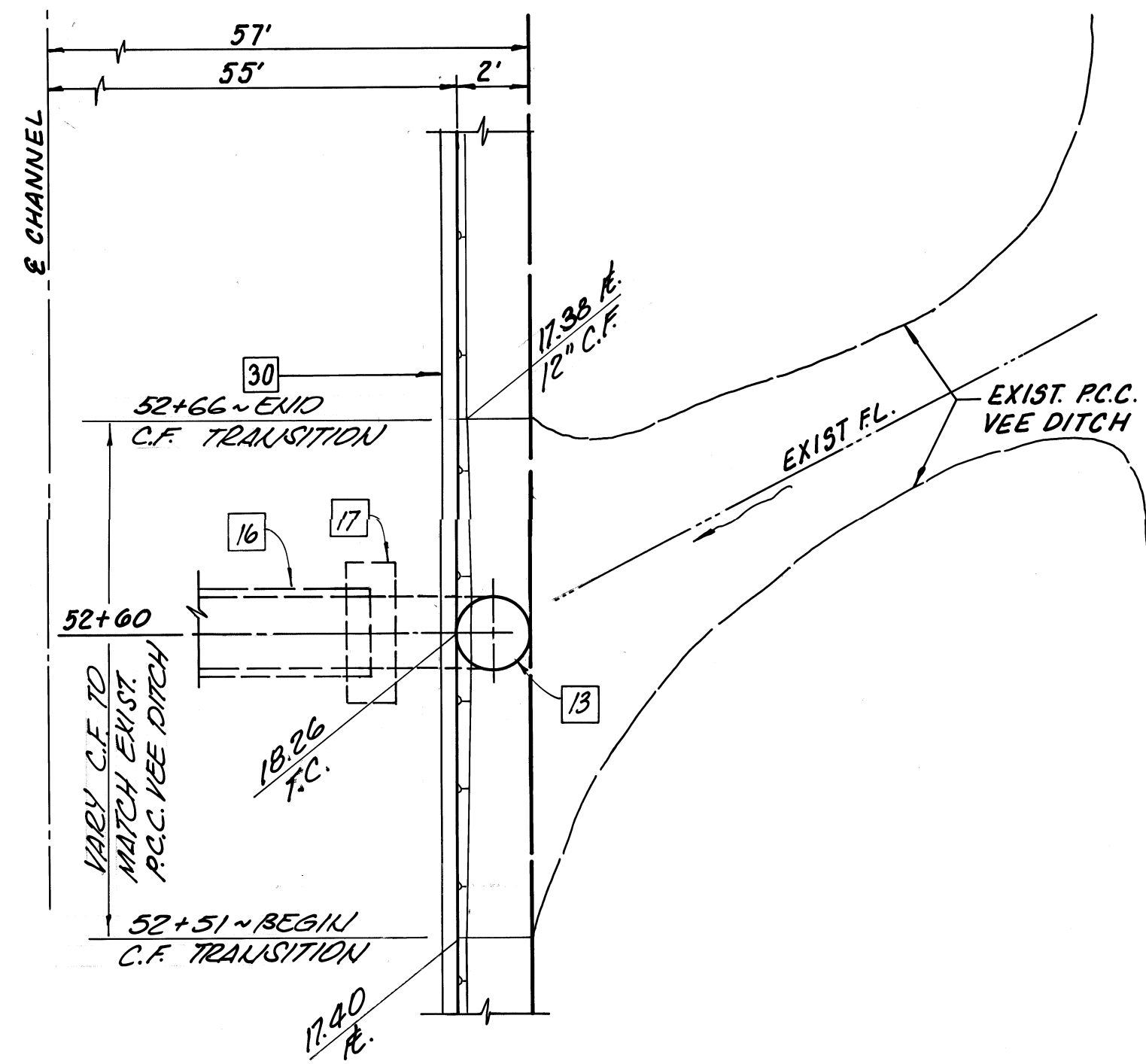
MARK DATE DESCRIPTION PREPARED UNDER SUPERVISION OF RCE 26879 DATE 5

DESIGNED AWM SCALE DATE DWG. NO. 5

DRAWN HCC, MSB CHECKED VJC AS SHOWN APR 1987 FOI-701-11A OF 40

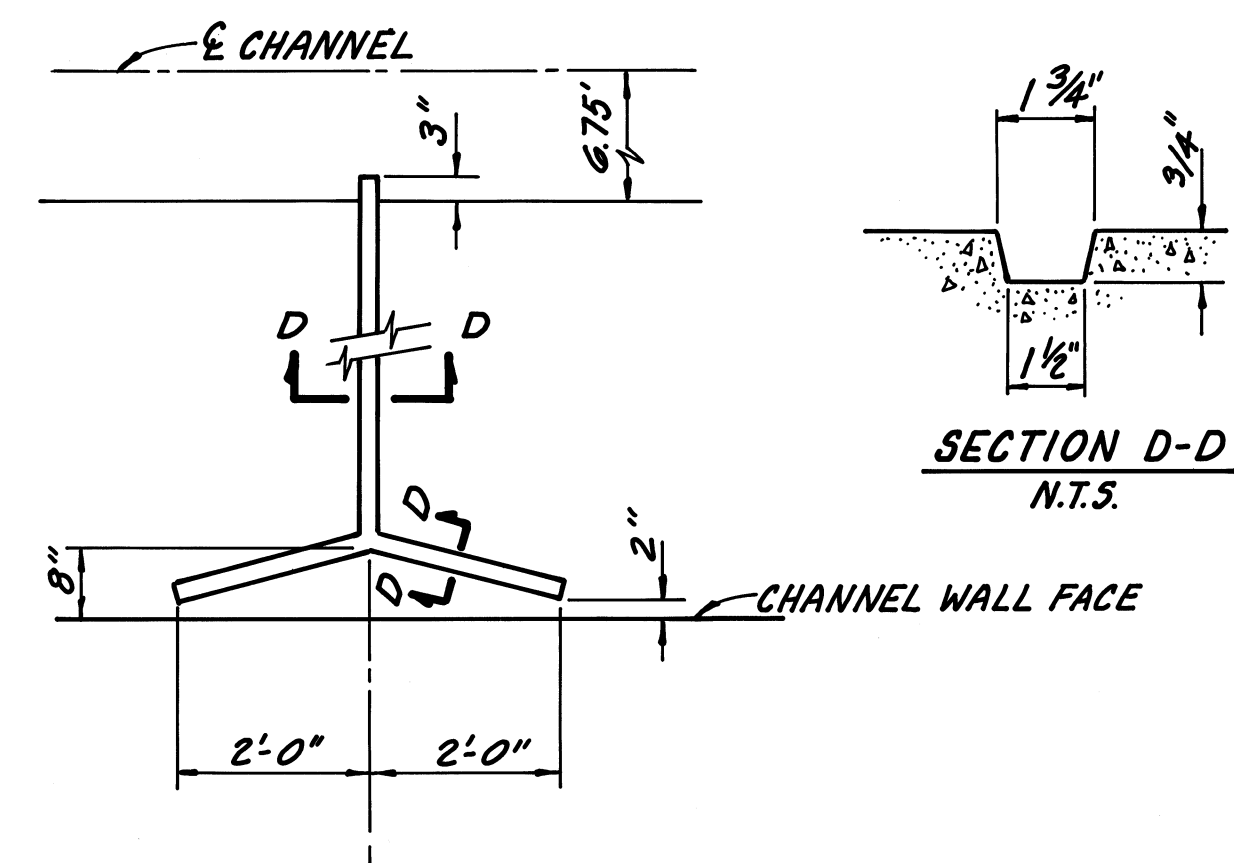


PROFILE
N.T.S.

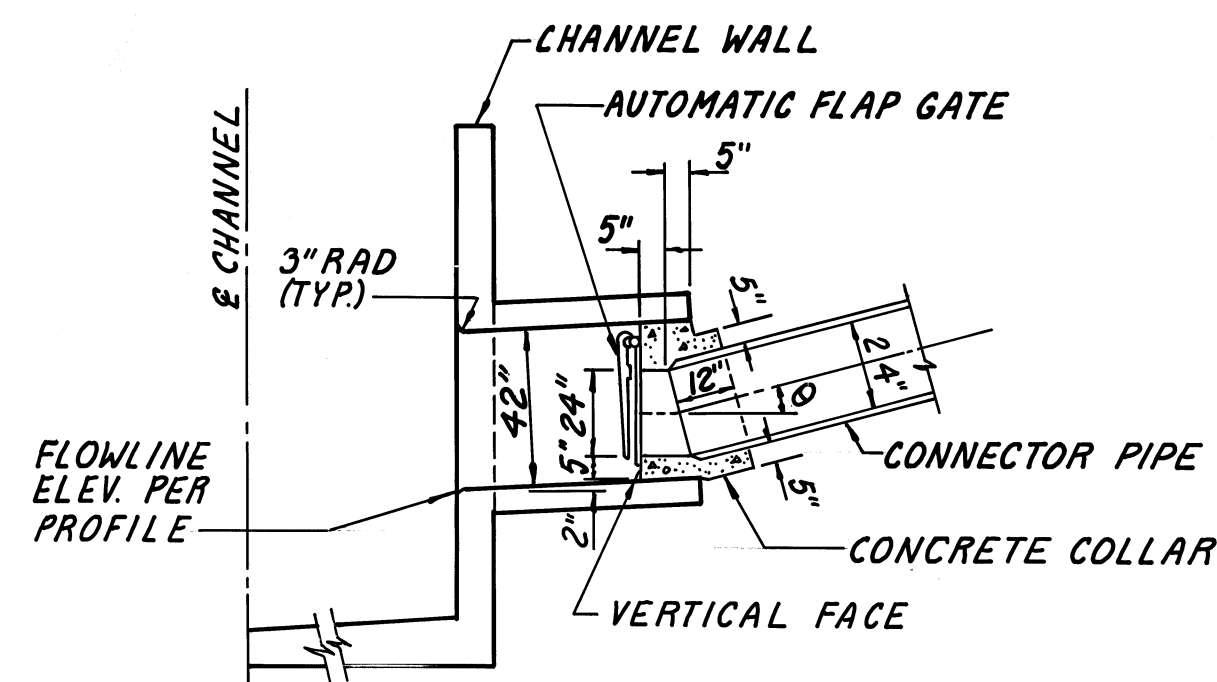


PLAN
N.T.S.

INLET DETAIL AT STA. 52+60
SHEET 5

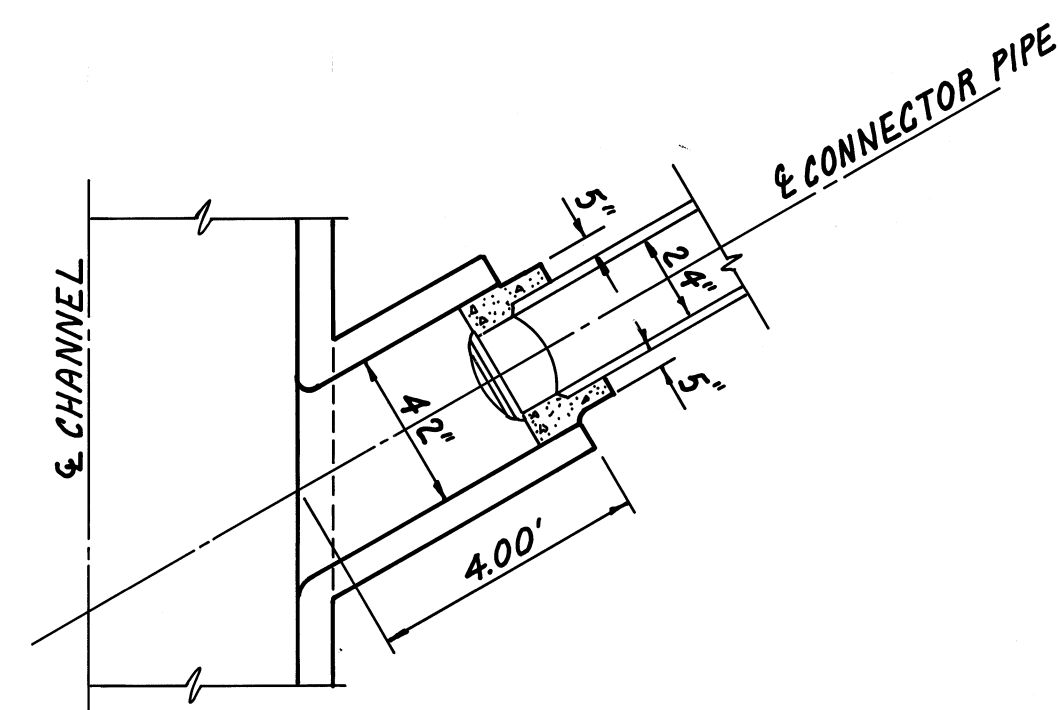


DRAINAGE GROOVE DETAIL 24
1" = 2'-0"



NOTES

1. MOUNTING BOLTS SHALL BE OF STAINLESS STEEL.
2. THE FLAPGATE SHALL BE ARMCO, WATERMAN, CASCADE OR DISTRICT APPROVED EQUAL AUTOMATIC FLAPGATE, DESIGNED FOR 20 FEET OF SEATING HEAD UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS.
3. THE CONCRETE COLLAR SHALL BE REINFORCED PER STD. DWG. NO. 1317 WHEN ANGLE θ EXCEEDS 10° .
4. FLAPGATE MAY BE EITHER SPIGOT BACK OR FLAT BACK.
5. BUSHINGS SHALL BE BRONZE.



MODIFIED JUNCTION STRUCTURE WITH AUTOMATIC FLAP GATE
NOT TO SCALE 44

CONSTRUCTION NOTES

1. CONSTRUCT R.C. RECT. CHANNEL PER PLAN, PROFILE AND TYPICAL SECTION AND PER STRUCTURAL DETAILS ON SHEET 18.
5. CONSTRUCT 5' C.L. FENCE AND/OR GATE PER PLAN AND TYPICAL SECTION AND PER STD. PLAN 1412.
9. CONSTRUCT 3" ASPHALT CONCRETE PAVEMENT WITH TACK COAT PER PLANS AND TYPICAL SECTIONS.
13. CONSTRUCT INLET TYPE V PER PLAN AND PER STD. PLAN 1305.
16. INSTALL 24" R.C.P. 2000-D, BEDDING PER STD. PLAN 1319.
17. CONSTRUCT REINFORCED CONCRETE COLLAR PER STD. PLAN 1317.
24. CONSTRUCT DRAINAGE GROOVE PER DETAIL ON SHEET 15.
30. CONSTRUCT MODIFIED CURB AND GUTTER TYPE A-2 PER STD. PLAN 104-O-OC. CURB FACE VARIES 6" TO 12". W=1'-6".
33. CONSTRUCT ACCESS RAMP WALL 'C' PER DETAILS ON SHEET 20.
44. CONSTRUCT MODIFIED JUNCTION STRUCTURE TYPE V WITH AUTOMATIC FLAP GATE PER STD. PLAN 1314 AND PER DETAIL ON SHEET 15.

1 1/2 0 1 2
3 inches on original drawing



ORANGE COUNTY ENVIRONMENTAL MANAGEMENT AGENCY		SANTA ANA-DELHI CHANNEL (FOI)	
MISCELLANEOUS DETAILS			
MARK	DATE	DESCRIPTION	PREPARED UNDER SUPERVISION OF
REVISIONS		DATE	RCE 26879
DESIGNED AWM	SCALE	DATE	DWG. NO.
DRAWN HCC	CHECKED	AS SHOWN	APR 1987

SHEET
15
OF 40

Appendix 3

Soil Type Map



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Orange County and Part of Riverside County, California



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Custom Soil Resource Report

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

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: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023

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

Date(s) aerial images were photographed: Jan 17, 2023—Feb 8, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
173	Myford sandy loam, 2 to 9 percent slopes	19.5	16.7%
174	Myford sandy loam, 2 to 9 percent slopes, eroded	0.5	0.4%
175	Myford sandy loam, 9 to 15 percent slopes	35.4	30.3%
177	Myford sandy loam, 9 to 30 percent slopes, eroded	2.7	2.3%
178	Myford sandy loam, thick surface, 0 to 2 percent slopes	35.1	30.1%
210	Thapto-Histic Fluvaquents	17.1	14.7%
218	Xeralfic arents, loamy, 9 to 15 percent slopes	6.6	5.6%
Totals for Area of Interest		116.8	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor

components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Orange County and Part of Riverside County, California

173—Myford sandy loam, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: hcnl
Elevation: 0 to 1,560 feet
Mean annual precipitation: 11 to 18 inches
Mean annual air temperature: 62 to 65 degrees F
Frost-free period: 320 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Myford and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

A1 - 0 to 1 inches: sandy loam
A2 - 1 to 4 inches: sandy loam
A3 - 4 to 12 inches: sandy loam
Bt1 - 12 to 18 inches: sandy clay
Bt2 - 18 to 28 inches: sandy clay loam
Btk1 - 28 to 35 inches: sandy clay loam
Btk2 - 35 to 41 inches: sandy clay loam
B't1 - 41 to 49 inches: sandy clay loam
B't2 - 49 to 61 inches: sandy clay loam
Bt3 - 61 to 71 inches: sandy clay loam
C - 71 to 79 inches: sandy loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 8 to 20 inches to abrupt textural change
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 1.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3e

173. Hydrologic Soil Group: C

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Minor Components

Myford, thick surface

Percent of map unit: 10 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Capistrano

Percent of map unit: 5 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R019XD029CA - LOAMY

Hydric soil rating: No

Yorba, gravelly sandy loam

Percent of map unit: 5 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Chesterton, loamy sand

Percent of map unit: 3 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Water

Percent of map unit: 2 percent

Landform: Depressions

174—Myford sandy loam, 2 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcnm
Elevation: 20 to 1,070 feet
Mean annual precipitation: 11 to 17 inches
Mean annual air temperature: 63 to 65 degrees F
Frost-free period: 320 to 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Myford, eroded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford, Eroded

Setting

Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sandstone

Typical profile

A - 0 to 7 inches: sandy loam
Bt - 7 to 11 inches: sandy clay
Btk - 11 to 21 inches: sandy clay loam
B't - 21 to 64 inches: sandy clay loam
C - 64 to 79 inches: sandy loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 4 to 10 inches to abrupt textural change
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C

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Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Minor Components

Myford, sandy loam

Percent of map unit: 10 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Yorba, gravelly sandy loam

Percent of map unit: 5 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

175—Myford sandy loam, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcn

Elevation: 1,500 feet

Mean annual precipitation: 12 to 20 inches

Mean annual air temperature: 63 degrees F

Frost-free period: 270 to 350 days

Farmland classification: Not prime farmland

Map Unit Composition

Myford and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford

Setting

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Riser

Down-slope shape: Concave

Across-slope shape: Linear

Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 12 inches: sandy loam

H2 - 12 to 18 inches: sandy clay

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H3 - 18 to 28 inches: sandy clay loam

H4 - 28 to 71 inches: sandy clay loam

H5 - 71 to 79 inches: sandy loam

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

175- *Hydrologic Soil Group: D*

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Minor Components

Capistrano, sandy loam

Percent of map unit: 5 percent

Hydric soil rating: No

Myford, sandy loam, eroded

Percent of map unit: 5 percent

Hydric soil rating: No

Yorba, gravelly sandy loam

Percent of map unit: 3 percent

Hydric soil rating: No

San andreas, sandy loam

Percent of map unit: 2 percent

Hydric soil rating: No

177—Myford sandy loam, 9 to 30 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcnq

Elevation: 0 to 2,100 feet

Mean annual precipitation: 11 to 18 inches

Mean annual air temperature: 62 to 65 degrees F

Frost-free period: 290 to 365 days

Farmland classification: Not prime farmland

Map Unit Composition

Myford and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford

Setting

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Alluvium derived from sandstone

Typical profile

A - 0 to 7 inches: sandy loam

Bt - 7 to 11 inches: sandy clay

Btk - 11 to 21 inches: sandy clay loam

B't - 21 to 64 inches: sandy clay loam

C - 64 to 79 inches: sandy loam

Properties and qualities

Slope: 9 to 30 percent

Depth to restrictive feature: 4 to 10 inches to abrupt textural change

Drainage class: Moderately well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 0.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Minor Components

Myford, sandy loam

Percent of map unit: 10 percent

Landform: Terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Riser

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Cieneba, sandy loam

Percent of map unit: 3 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R019XD060CA - SHALLOW LOAMY
Hydric soil rating: No

Yorba, cobbly sandy loam

Percent of map unit: 2 percent
Landform: Terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R019XD061CA - CLAYPAN
Hydric soil rating: No

178—Myford sandy loam, thick surface, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcnr
Elevation: 1,500 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 to 350 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Myford and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Myford

Setting

Landform: Terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed

Typical profile

H1 - 0 to 22 inches: sandy loam
H2 - 22 to 28 inches: sandy clay
H3 - 28 to 38 inches: sandy clay loam
H4 - 38 to 71 inches: sandy clay loam

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H5 - 71 to 79 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 2.6 inches)

Interpretive groups

Land capability classification (irrigated): 3s

Land capability classification (nonirrigated): 3s

178 *Hydrologic Soil Group: D*

Ecological site: R019XD061CA - CLAYPAN

Hydric soil rating: No

Minor Components

Myford, sandy loam

Percent of map unit: 10 percent

Hydric soil rating: No

Myford, steeper sloping

Percent of map unit: 5 percent

Hydric soil rating: No

Yorba, gravelly sandy loam

Percent of map unit: 3 percent

Hydric soil rating: No

Chesterson, loamy sand

Percent of map unit: 3 percent

Hydric soil rating: No

Capistrano, sandy loam

Percent of map unit: 3 percent

Hydric soil rating: No

Unnamed, ponded

Percent of map unit: 1 percent

Landform: Depressions

Hydric soil rating: Yes

210—Thapto-Histic Fluvaquents

Map Unit Setting

National map unit symbol: hcps

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Elevation: 20 feet

Mean annual precipitation: 15 inches

Mean annual air temperature: 59 degrees F

Frost-free period: 365 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Thapto-histic fluvaquents and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Thapto-histic Fluvaquents

Setting

Landform: Beach plains

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Organic material and/or mixed alluvium

Typical profile

Ap - 0 to 9 inches: mucky clay

A - 9 to 21 inches: mucky silty clay

20a - 21 to 56 inches: highly decomposed plant material

3C - 56 to 68 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 24 to 42 inches

Frequency of flooding: Rare

Frequency of ponding: None

Calcium carbonate, maximum content: 5 percent

Maximum salinity: Slightly saline to moderately saline (4.0 to 8.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): 3w

Land capability classification (nonirrigated): 3w

210- Hydrologic Soil Group: D

Ecological site: R019XG902CA - Beaches

Hydric soil rating: Yes

Minor Components

Chino, silty clay loam

Percent of map unit: 5 percent

Hydric soil rating: No

Unnamed, steeper soils

Percent of map unit: 5 percent

Hydric soil rating: No

Bolsa, silty clay loam

Percent of map unit: 2 percent

Hydric soil rating: No

Bolsa, silt loam

Percent of map unit: 2 percent

Hydric soil rating: No

Omni, clay

Percent of map unit: 1 percent

Hydric soil rating: No

218—Xeralfic arents, loamy, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: hcq1

Elevation: 0 to 2,500 feet

Mean annual precipitation: 12 to 15 inches

Mean annual air temperature: 63 to 66 degrees F

Frost-free period: 365 days

Farmland classification: Not prime farmland

Map Unit Composition

Xeralfic arents and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Xeralfic Arents

Setting

Landform: Hills

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Concave

Across-slope shape: Convex

Typical profile

H1 - 0 to 60 inches: variable

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Well drained

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified

Ecological site: F019XG913CA - Loamy Hills <30"ppt

Hydric soil rating: No

Minor Components

Unnamed, undisturbed

Percent of map unit: 15 percent

Hydric soil rating: No

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Appendix 4

Existing Condition Hydrology Calculations


```

COMMERCIAL          D          0.88      0.20      0.100      57      5.34
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 1.71
TOTAL AREA(ACRES) = 0.88 PEAK FLOW RATE(CFS) = 1.71

```

```

*****
FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 5.34
RAINFALL INTENSITY(INCH/HR) = 2.18
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.88
TOTAL STREAM AREA(ACRES) = 0.88
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.71

```

```

*****
FLOW PROCESS FROM NODE 11.10 TO NODE 11.20 IS CODE = 21

```

```

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

```

```

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 63.00 DOWNSTREAM(FEET) = 62.00

```

```

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.862
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.533
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/  SCS SOIL  AREA      Fp      Ap      SCS  Tc
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL        D        0.67      0.20      0.100      57      9.86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 0.91
TOTAL AREA(ACRES) = 0.67 PEAK FLOW RATE(CFS) = 0.91

```



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*****
FLOW PROCESS FROM NODE 11.20 TO NODE 11.30 IS CODE = 91

```

```

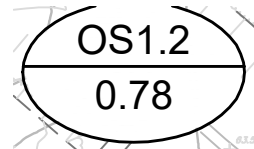
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

```

```

=====
UPSTREAM NODE ELEVATION(FEET) = 62.00
DOWNSTREAM NODE ELEVATION(FEET) = 55.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 173.00
"V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.160
PAVEMENT LIP(FEET) = 0.010 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 10.00
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.476
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/  SCS SOIL  AREA      Fp      Ap      SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL        D        0.78      0.20      0.100      57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.42
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.29
AVERAGE FLOW DEPTH(FEET) = 0.19 FLOOD WIDTH(FEET) = 4.62
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.67 Tc(MIN.) = 10.53
SUBAREA AREA(ACRES) = 0.78 SUBAREA RUNOFF(CFS) = 1.02
EFFECTIVE AREA(ACRES) = 1.45 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

```



TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 1.90

END OF SUBAREA "V" GUTTER HYDRAULICS:

DEPTH(FEET) = 0.20 FLOOD WIDTH(FEET) = 6.42
 FLOW VELOCITY(FEET/SEC.) = 4.41 DEPTH*VELOCITY(FT*FT/SEC) = 0.90
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.30 = 503.00 FEET.

FLOW PROCESS FROM NODE 11.30 TO NODE 11.40 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 38.00
 FLOW LENGTH(FEET) = 52.00 MANNING'S N = 0.015
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.25
 GIVEN PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.90
 PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 10.61
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.40 = 555.00 FEET.

FLOW PROCESS FROM NODE 11.40 TO NODE 11.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 33.50
 CHANNEL LENGTH THRU SUBAREA(FEET) = 150.00 CHANNEL SLOPE = 0.0300
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 1.90
 FLOW VELOCITY(FEET/SEC.) = 2.51 FLOW DEPTH(FEET) = 0.05
 TRAVEL TIME(MIN.) = 1.00 Tc(MIN.) = 11.60
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.00 = 705.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 11.60
 RAINFALL INTENSITY(INCH/HR) = 1.40
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.45
 TOTAL STREAM AREA(ACRES) = 1.45
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.90

FLOW PROCESS FROM NODE 11.50 TO NODE 11.60 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 265.00
 ELEVATION DATA: UPSTREAM(FEET) = 62.00 DOWNSTREAM(FEET) = 55.00

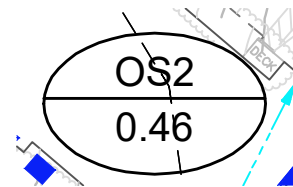
$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.859

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.067

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.46	0.20	0.100	57	5.86



SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.20$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA RUNOFF(CFS) = 0.85
 TOTAL AREA(ACRES) = 0.46 PEAK FLOW RATE(CFS) = 0.85

 FLOW PROCESS FROM NODE 11.60 TO NODE 11.70 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	53.00	DOWNSTREAM(FEET) =	38.00
FLOW LENGTH(FEET) =	52.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	6.0 INCH PIPE IS	2.2 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	12.70		
GIVEN PIPE DIAMETER(INCH) =	6.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	0.85		
PIPE TRAVEL TIME(MIN.) =	0.07	$T_c(\text{MIN.}) =$	5.93
LONGEST FLOWPATH FROM NODE	11.50 TO NODE	11.70 =	317.00 FEET.

 FLOW PROCESS FROM NODE 11.70 TO NODE 11.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	38.00	DOWNSTREAM(FEET) =	33.50
CHANNEL LENGTH THRU SUBAREA(FEET) =	143.00	CHANNEL SLOPE =	0.0315
CHANNEL BASE(FEET) =	15.00	"Z" FACTOR =	0.000
MANNING'S FACTOR =	0.015	MAXIMUM DEPTH(FEET) =	10.00
CHANNEL FLOW THRU SUBAREA(CFS) =	0.85		
FLOW VELOCITY(FEET/SEC.) =	1.69	FLOW DEPTH(FEET) =	0.03
TRAVEL TIME(MIN.) =	1.41	$T_c(\text{MIN.}) =$	7.34
LONGEST FLOWPATH FROM NODE	11.50 TO NODE	11.00 =	460.00 FEET.

 FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 7.34
 RAINFALL INTENSITY(INCH/HR) = 1.82
 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.02$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.20$
 AREA-AVERAGED $A_p = 0.10$
 EFFECTIVE STREAM AREA(ACRES) = 0.46
 TOTAL STREAM AREA(ACRES) = 0.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.85

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	1.71	5.34	2.180	0.20(0.02)	0.10	0.9	10.00
2	1.90	11.60	1.396	0.20(0.02)	0.10	1.5	11.10
3	0.85	7.34	1.817	0.20(0.02)	0.10	0.5	11.50

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	3.82	5.34	2.180	0.20(0.02)	0.10	1.9	10.00
2	3.84	7.34	1.817	0.20(0.02)	0.10	2.3	11.50
3	3.64	11.60	1.396	0.20(0.02)	0.10	2.8	11.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 3.84 Tc(MIN.) = 7.34
 EFFECTIVE AREA(ACRES) = 2.26 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 2.8
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.00 = 705.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 33.50 DOWNSTREAM(FEET) = 29.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 174.00 CHANNEL SLOPE = 0.0259
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.695
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.24	0.20	0.100	57

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.02
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.09
 AVERAGE FLOW DEPTH(FEET) = 0.09 TRAVEL TIME(MIN.) = 0.94
 Tc(MIN.) = 8.27
 SUBAREA AREA(ACRES) = 0.24 SUBAREA RUNOFF(CFS) = 0.36
 EFFECTIVE AREA(ACRES) = 2.50 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 3.84
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.09 FLOW VELOCITY(FEET/SEC.) = 2.95
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 12.00 = 879.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.82	6.27	1.987	0.20(0.02)	0.10	2.1	10.00
2	3.84	8.27	1.695	0.20(0.02)	0.10	2.5	11.50
3	3.64	12.54	1.336	0.20(0.02)	0.10	3.0	11.10

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 3.84 Tc(MIN.) = 8.27
 AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 2.50

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 8.27
 RAINFALL INTENSITY(INCH/HR) = 1.70
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.50
 TOTAL STREAM AREA(ACRES) = 3.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.84

FLOW PROCESS FROM NODE 12.10 TO NODE 12.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 270.00
 ELEVATION DATA: UPSTREAM(FEET) = 58.00 DOWNSTREAM(FEET) = 54.00

$$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 6.626

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.926

SUBAREA T_c AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
COMMERCIAL	C	2.03	0.25	0.100	50	6.63

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.25SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA RUNOFF(CFS) = 3.47

TOTAL AREA(ACRES) = 2.03 PEAK FLOW RATE(CFS) = 3.47

FLOW PROCESS FROM NODE 12.20 TO NODE 12.30 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 45.00

FLOW LENGTH(FEET) = 200.00 MANNING'S N = 0.013

ASSUME FULL-FLOWING PIPELINE

PIPE-FLOW VELOCITY(FEET/SEC.) = 17.69

PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)

GIVEN PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 3.47

PIPE TRAVEL TIME(MIN.) = 0.19 T_c (MIN.) = 6.81

LONGEST FLOWPATH FROM NODE 12.10 TO NODE 12.30 = 470.00 FEET.

FLOW PROCESS FROM NODE 12.30 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 45.00 DOWNSTREAM(FEET) = 29.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00 CHANNEL SLOPE = 0.0457

CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.683

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	1.26	0.20	0.100	57

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.42

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.72

AVERAGE FLOW DEPTH(FEET) = 0.08 TRAVEL TIME(MIN.) = 1.57

 T_c (MIN.) = 8.38

SUBAREA AREA(ACRES) = 1.26 SUBAREA RUNOFF(CFS) = 1.89

EFFECTIVE AREA(ACRES) = 3.29 AREA-AVERAGED F_m (INCH/HR) = 0.02AREA-AVERAGED F_p (INCH/HR) = 0.23 AREA-AVERAGED A_p = 0.10

TOTAL AREA(ACRES) = 3.3 PEAK FLOW RATE(CFS) = 4.91

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.08 FLOW VELOCITY(FEET/SEC.) = 4.04

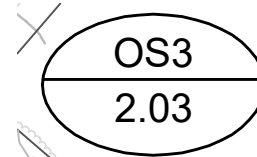
LONGEST FLOWPATH FROM NODE 12.10 TO NODE 12.00 = 820.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<

=====



TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 8.38
 RAINFALL INTENSITY(INCH/HR) = 1.68
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.23
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 3.29
 TOTAL STREAM AREA(ACRES) = 3.29
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.91

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.82	6.27	1.987	0.20(0.02)	0.10	2.1	10.00
1	3.84	8.27	1.695	0.20(0.02)	0.10	2.5	11.50
1	3.64	12.54	1.336	0.20(0.02)	0.10	3.0	11.10
2	4.91	8.38	1.683	0.23(0.02)	0.10	3.3	12.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.18	6.27	1.987	0.22(0.02)	0.10	4.6	10.00
2	8.73	8.27	1.695	0.22(0.02)	0.10	5.7	11.50
3	8.75	8.38	1.683	0.22(0.02)	0.10	5.8	12.10
4	7.53	12.54	1.336	0.22(0.02)	0.10	6.3	11.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 8.75 Tc(MIN.) = 8.38
 EFFECTIVE AREA(ACRES) = 5.80 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 6.3
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 12.00 = 879.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 29.00 DOWNSTREAM(FEET) = 26.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 134.00 CHANNEL SLOPE = 0.0224

CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.624

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.80	0.20	0.100	57

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.32

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.15

AVERAGE FLOW DEPTH(FEET) = 0.15 TRAVEL TIME(MIN.) = 0.54

Tc(MIN.) = 8.92

SUBAREA AREA(ACRES) = 0.80 SUBAREA RUNOFF(CFS) = 1.15

EFFECTIVE AREA(ACRES) = 6.60 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 7.1 PEAK FLOW RATE(CFS) = 9.52

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.15 FLOW VELOCITY(FEET/SEC.) = 4.24

LONGEST FLOWPATH FROM NODE 11.10 TO NODE 13.00 = 1013.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM	Q	Tc	Intensity	Fp(Fm)	Ap	Ae	HEADWATER
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NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	9.07	6.83	1.892	0.21(0.02)	0.10	5.4 10.00
2	9.50	8.81	1.635	0.22(0.02)	0.10	6.5 11.50
3	9.52	8.92	1.624	0.22(0.02)	0.10	6.6 12.10
4	8.21	13.10	1.302	0.21(0.02)	0.10	7.1 11.10

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 9.52 Tc(MIN.) = 8.92

AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.22

AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 6.60

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+-----+
| SUBAREA B                                     |
|-----|
+-----+

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FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 122.00

ELEVATION DATA: UPSTREAM(FEET) = 30.00 DOWNSTREAM(FEET) = 15.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.264

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.09	0.20	0.100	57	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.18

TOTAL AREA(ACRES) = 0.09 PEAK FLOW RATE(CFS) = 0.18

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+-----+
| SUBAREA C                                     |
|-----|
+-----+

```

FLOW PROCESS FROM NODE 30.00 TO NODE 31.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 266.00

ELEVATION DATA: UPSTREAM(FEET) = 31.00 DOWNSTREAM(FEET) = 22.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.870

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.886

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "8-10 DWELLINGS/ACRE"	D	0.69	0.20	0.400	57	6.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.400

SUBAREA RUNOFF(CFS) = 1.12

TOTAL AREA(ACRES) = 0.69 PEAK FLOW RATE(CFS) = 1.12

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+-----+
| SUBAREA D                                     |
|-----|
+-----+

```

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+-----+
*****
FLOW PROCESS FROM NODE      40.00 TO NODE      41.00 IS CODE =  21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) =  278.00
ELEVATION DATA: UPSTREAM(FEET) =   54.00  DOWNSTREAM(FEET) =   31.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  11.038
* 2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.437
SUBAREA Tc AND LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL      AREA      Fp      Ap      SCS      Tc
LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
URBAN FAIR COVER
"TURF"                  C         2.13      0.25      1.000      59  11.04
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =  2.28
TOTAL AREA(ACRES) =  2.13  PEAK FLOW RATE(CFS) =  2.28

*****
FLOW PROCESS FROM NODE      41.00 TO NODE      42.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   29.00  DOWNSTREAM(FEET) =   21.40
FLOW LENGTH(FEET) =  218.00  MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =  6.52
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) =  8.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =  2.28
PIPE TRAVEL TIME(MIN.) =  0.56  Tc(MIN.) =  11.60
LONGEST FLOWPATH FROM NODE      40.00 TO NODE      42.00 =  496.00 FEET.

*****
FLOW PROCESS FROM NODE      42.00 TO NODE      42.00 IS CODE =  81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) =  11.60
* 2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.397
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL      AREA      Fp      Ap      SCS
LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
URBAN FAIR COVER
"TURF"                  D         1.25      0.20      1.000      66
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =  1.25  SUBAREA RUNOFF(CFS) =  1.35
EFFECTIVE AREA(ACRES) =  3.38  AREA-AVERAGED Fm(INCH/HR) =  0.23
AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
TOTAL AREA(ACRES) =  3.4  PEAK FLOW RATE(CFS) =  3.54

*****
FLOW PROCESS FROM NODE      42.00 TO NODE      43.00 IS CODE =  41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   21.40  DOWNSTREAM(FEET) =   18.00
FLOW LENGTH(FEET) =  354.00  MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =  10.15

```

PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
 GIVEN PIPE DIAMETER(INCH) = 8.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.54
 PIPE TRAVEL TIME(MIN.) = 0.58 Tc(MIN.) = 12.18
 LONGEST FLOWPATH FROM NODE 40.00 TO NODE 43.00 = 850.00 FEET.

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+-----+
| SUBAREA E |
+-----+

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 FLOW PROCESS FROM NODE 50.00 TO NODE 51.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 150.00
 ELEVATION DATA: UPSTREAM(FEET) = 27.00 DOWNSTREAM(FEET) = 18.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.196
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.596
 SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
URBAN FAIR COVER "TURF"	D	0.36	0.20	1.000	66	9.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 0.45
 TOTAL AREA(ACRES) = 0.36 PEAK FLOW RATE(CFS) = 0.45

 FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 18.00 DOWNSTREAM(FEET) = 17.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 161.00 CHANNEL SLOPE = 0.0062
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.385
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER "TURF"	D	0.72	0.20	1.000	66

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.84
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.04
 AVERAGE FLOW DEPTH(FEET) = 0.15 TRAVEL TIME(MIN.) = 2.58
 Tc(MIN.) = 11.77
 SUBAREA AREA(ACRES) = 0.72 SUBAREA RUNOFF(CFS) = 0.77
 EFFECTIVE AREA(ACRES) = 1.08 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 1.1 PEAK FLOW RATE(CFS) = 1.15

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.18 FLOW VELOCITY(FEET/SEC.) = 1.17
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 311.00 FEET.

 FLOW PROCESS FROM NODE 52.00 TO NODE 52.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<

```

=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 11.77
RAINFALL INTENSITY(INCH/HR) = 1.38
AREA-AVERAGED Fm(INCH/HR) = 0.20
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 1.08
TOTAL STREAM AREA(ACRES) = 1.08
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.15

*****
FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 54.00 DOWNSTREAM(FEET) = 37.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.996
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.308
SUBAREA Tc AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
URBAN FAIR COVER
"TURF" C 1.20 0.25 1.000 59 13.00
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 1.000
SUBAREA RUNOFF(CFS) = 1.14
TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 1.14

*****
FLOW PROCESS FROM NODE 54.00 TO NODE 55.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 37.00 DOWNSTREAM(FEET) = 32.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 204.00 CHANNEL SLOPE = 0.0245
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.191
SUBAREA LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
URBAN FAIR COVER
"TURF" C 1.80 0.25 1.000 59
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 1.000
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.91
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.46
AVERAGE FLOW DEPTH(FEET) = 0.09 TRAVEL TIME(MIN.) = 2.32
Tc(MIN.) = 15.32
SUBAREA AREA(ACRES) = 1.80 SUBAREA RUNOFF(CFS) = 1.52
EFFECTIVE AREA(ACRES) = 3.00 AREA-AVERAGED Fm(INCH/HR) = 0.25
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 3.00 PEAK FLOW RATE(CFS) = 2.54

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.10 FLOW VELOCITY(FEET/SEC.) = 1.66
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 55.00 = 534.00 FEET.

*****
FLOW PROCESS FROM NODE 55.00 TO NODE 56.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

```

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>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 32.00 DOWNSTREAM(FEET) = 19.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 261.00 CHANNEL SLOPE = 0.0479
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.110
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
URBAN FAIR COVER
"TURF" D 1.35 0.20 1.000 66
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.09
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/Sec.) = 2.18
AVERAGE FLOW DEPTH(Feet) = 0.09 TRAVEL TIME(MIN.) = 1.99
Tc(MIN.) = 17.31
SUBAREA AREA(ACRES) = 1.35 SUBAREA RUNOFF(CFS) = 1.11
EFFECTIVE AREA(ACRES) = 4.35 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 4.3 PEAK FLOW RATE(CFS) = 3.43

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(Feet) = 0.10 FLOW VELOCITY(Feet/Sec.) = 2.24
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 56.00 = 795.00 FEET.

*****
FLOW PROCESS FROM NODE 56.00 TO NODE 52.00 IS CODE = 51
-----
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(Feet) = 19.50 DOWNSTREAM(Feet) = 17.00
CHANNEL LENGTH THRU SUBAREA(Feet) = 110.00 CHANNEL SLOPE = 0.0227
CHANNEL BASE(Feet) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(Feet) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 3.43
FLOW VELOCITY(Feet/Sec.) = 1.83 FLOW DEPTH(Feet) = 0.12
TRAVEL TIME(MIN.) = 1.00 Tc(MIN.) = 18.31
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 52.00 = 905.00 FEET.

*****
FLOW PROCESS FROM NODE 52.00 TO NODE 52.00 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.) = 18.31
RAINFALL INTENSITY(INCH/HR) = 1.07
AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.23
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 4.35
TOTAL STREAM AREA(ACRES) = 4.35
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.43

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 1.15 11.77 1.385 0.20( 0.20) 1.00 1.1 50.00
2 3.43 18.31 1.075 0.23( 0.23) 1.00 4.3 53.00

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

** PEAK FLOW RATE TABLE **

```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.17	11.77	1.385	0.22(0.22)	1.00	3.9	50.00
2	4.28	18.31	1.075	0.23(0.23)	1.00	5.4	53.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 4.28 Tc(MIN.) = 18.31
 EFFECTIVE AREA(ACRES) = 5.43 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 5.4
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 52.00 = 905.00 FEET.

FLOW PROCESS FROM NODE 52.00 TO NODE 57.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 17.00 DOWNSTREAM(FEET) = 16.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 253.00 CHANNEL SLOPE = 0.0040

CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 0.997

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER					
"TURF"	D	1.44	0.20	1.000	66

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.79

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.65

AVERAGE FLOW DEPTH(FEET) = 0.47 TRAVEL TIME(MIN.) = 2.55

Tc(MIN.) = 20.87

SUBAREA AREA(ACRES) = 1.44 SUBAREA RUNOFF(CFS) = 1.03

EFFECTIVE AREA(ACRES) = 6.87 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 4.79

=====

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.47 FLOW VELOCITY(FEET/SEC.) = 1.65

LONGEST FLOWPATH FROM NODE 53.00 TO NODE 57.00 = 1158.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	4.87	14.34	1.236	0.22(0.22)	1.00	5.3	50.00
2	4.79	20.87	0.997	0.22(0.22)	1.00	6.9	53.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 4.87 Tc(MIN.) = 14.34

AREA-AVERAGED Fm(INCH/HR) = 0.22 AREA-AVERAGED Fp(INCH/HR) = 0.22

AREA-AVERAGED Ap = 1.00 EFFECTIVE AREA(ACRES) = 5.32

FLOW PROCESS FROM NODE 57.00 TO NODE 58.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 16.00 DOWNSTREAM(FEET) = 15.50

CHANNEL LENGTH THRU SUBAREA(FEET) = 107.00 CHANNEL SLOPE = 0.0047

CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.190

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER					
"TURF"	D	1.22	0.20	1.000	66

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.20$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.42
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.80
 AVERAGE FLOW DEPTH(FEET) = 0.48 TRAVEL TIME(MIN.) = 0.99
 $T_c(\text{MIN.}) = 15.33$
 SUBAREA AREA(ACRES) = 1.22 SUBAREA RUNOFF(CFS) = 1.09
 EFFECTIVE AREA(ACRES) = 6.54 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.21$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.21$ AREA-AVERAGED $A_p = 1.00$
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 5.74

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.50 FLOW VELOCITY(FEET/SEC.) = 1.84
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 58.00 = 1265.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	5.74	15.33	1.190	0.21(0.21)	1.00	6.5	50.00
2	5.48	21.86	0.971	0.22(0.22)	1.00	8.1	53.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 5.74 $T_c(\text{MIN.}) = 15.33$
 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.21$ AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.21$
 AREA-AVERAGED $A_p = 1.00$ EFFECTIVE AREA(ACRES) = 6.54

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.1 $T_c(\text{MIN.}) = 15.33$
 EFFECTIVE AREA(ACRES) = 6.54 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.21$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.21$ AREA-AVERAGED $A_p = 1.000$
 PEAK FLOW RATE(CFS) = 5.74

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	5.74	15.33	1.190	0.21(0.21)	1.00	6.5	50.00
2	5.48	21.86	0.971	0.22(0.22)	1.00	8.1	53.00

END OF RATIONAL METHOD ANALYSIS



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

Analysis prepared by:

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 Irvine, CA 92618

***** DESCRIPTION OF STUDY *****
 * SNUG HARBOR *
 * EXISTING CONDITION *
 * 25 YR *

FILE NAME: SNUG2EX.DAT
 TIME/DATE OF STUDY: 16:51 08/06/2024

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

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

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANING FACTOR (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.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

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+-----+
| SUBAREA A                                     |
|                                               |
+-----+
  
```

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
 ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 33.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.339

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.648

SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
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COMMERCIAL          D          0.88      0.20      0.100      75      5.34
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 3.67
TOTAL AREA(ACRES) = 0.88 PEAK FLOW RATE(CFS) = 3.67

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*****
FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 5.34
RAINFALL INTENSITY(INCH/HR) = 4.65
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.88
TOTAL STREAM AREA(ACRES) = 0.88
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.67

```

```

*****
FLOW PROCESS FROM NODE 11.10 TO NODE 11.20 IS CODE = 21
-----

```

```

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

```

```

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 63.00 DOWNSTREAM(FEET) = 62.00

```

```

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.862
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.284
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA      Fp      Ap      SCS   Tc
LAND USE           GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL          D        0.67    0.20    0.100    75    9.86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 1.97
TOTAL AREA(ACRES) = 0.67 PEAK FLOW RATE(CFS) = 1.97

```

```

*****
FLOW PROCESS FROM NODE 11.20 TO NODE 11.30 IS CODE = 91
-----

```

```

>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=====

```

```

UPSTREAM NODE ELEVATION(FEET) = 62.00
DOWNSTREAM NODE ELEVATION(FEET) = 55.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 173.00
"V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.160
PAVEMENT LIP(FEET) = 0.010 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 10.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.170
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/   SCS SOIL   AREA      Fp      Ap      SCS
LAND USE           GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          D        0.78    0.20    0.100    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.07
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.52
AVERAGE FLOW DEPTH(FEET) = 0.24 FLOOD WIDTH(FEET) = 9.54
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.64 Tc(MIN.) = 10.50
SUBAREA AREA(ACRES) = 0.78 SUBAREA RUNOFF(CFS) = 2.21
EFFECTIVE AREA(ACRES) = 1.45 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

```

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 4.11

END OF SUBAREA "V" GUTTER HYDRAULICS:

DEPTH(FEET) = 0.25 FLOOD WIDTH(FEET) = 11.46
 FLOW VELOCITY(FEET/SEC.) = 4.66 DEPTH*VELOCITY(FT*FT/SEC) = 1.19
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.30 = 503.00 FEET.

FLOW PROCESS FROM NODE 11.30 TO NODE 11.40 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 38.00
 FLOW LENGTH(FEET) = 52.00 MANNING'S N = 0.015
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 2.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 15.45
 GIVEN PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.11
 PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 10.56
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.40 = 555.00 FEET.

FLOW PROCESS FROM NODE 11.40 TO NODE 11.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 33.50
 CHANNEL LENGTH THRU SUBAREA(FEET) = 150.00 CHANNEL SLOPE = 0.0300
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 4.11
 FLOW VELOCITY(FEET/SEC.) = 3.16 FLOW DEPTH(FEET) = 0.09
 TRAVEL TIME(MIN.) = 0.79 Tc(MIN.) = 11.35
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.00 = 705.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 11.35
 RAINFALL INTENSITY(INCH/HR) = 3.03
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.45
 TOTAL STREAM AREA(ACRES) = 1.45
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.11

FLOW PROCESS FROM NODE 11.50 TO NODE 11.60 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 265.00
 ELEVATION DATA: UPSTREAM(FEET) = 62.00 DOWNSTREAM(FEET) = 55.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.859

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.410

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.46	0.20	0.100	75	5.86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.20$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA RUNOFF(CFS) = 1.82
 TOTAL AREA(ACRES) = 0.46 PEAK FLOW RATE(CFS) = 1.82

 FLOW PROCESS FROM NODE 11.60 TO NODE 11.70 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	53.00	DOWNSTREAM(FEET) =	38.00
FLOW LENGTH(FEET) =	52.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	6.0 INCH PIPE IS	3.5 INCHES	
PIPE-FLOW VELOCITY(FEET/SEC.) =	15.43		
GIVEN PIPE DIAMETER(INCH) =	6.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	1.82		
PIPE TRAVEL TIME(MIN.) =	0.06	$T_c(\text{MIN.}) =$	5.91
LONGEST FLOWPATH FROM NODE	11.50 TO NODE	11.70 =	317.00 FEET.

 FLOW PROCESS FROM NODE 11.70 TO NODE 11.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) =	38.00	DOWNSTREAM(FEET) =	33.50
CHANNEL LENGTH THRU SUBAREA(FEET) =	143.00	CHANNEL SLOPE =	0.0315
CHANNEL BASE(FEET) =	15.00	"Z" FACTOR =	0.000
MANNING'S FACTOR =	0.015	MAXIMUM DEPTH(FEET) =	10.00
CHANNEL FLOW THRU SUBAREA(CFS) =	1.82		
FLOW VELOCITY(FEET/SEC.) =	2.40	FLOW DEPTH(FEET) =	0.05
TRAVEL TIME(MIN.) =	0.99	$T_c(\text{MIN.}) =$	6.91
LONGEST FLOWPATH FROM NODE	11.50 TO NODE	11.00 =	460.00 FEET.

 FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 6.91
 RAINFALL INTENSITY(INCH/HR) = 4.02
 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.02$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.20$
 AREA-AVERAGED $A_p = 0.10$
 EFFECTIVE STREAM AREA(ACRES) = 0.46
 TOTAL STREAM AREA(ACRES) = 0.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.82

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	3.67	5.34	4.648	0.20(0.02)	0.10	0.9	10.00
2	4.11	11.35	3.033	0.20(0.02)	0.10	1.5	11.10
3	1.82	6.91	4.017	0.20(0.02)	0.10	0.5	11.50

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	8.26	5.34	4.648	0.20(0.02)	0.10	1.9	10.00
2	8.30	6.91	4.017	0.20(0.02)	0.10	2.2	11.50
3	7.87	11.35	3.033	0.20(0.02)	0.10	2.8	11.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 8.30 Tc(MIN.) = 6.91
 EFFECTIVE AREA(ACRES) = 2.22 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 2.8
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.00 = 705.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 33.50 DOWNSTREAM(FEET) = 29.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 174.00 CHANNEL SLOPE = 0.0259
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.803
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.24	0.20	0.100	75

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.71
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.14
 AVERAGE FLOW DEPTH(FEET) = 0.14 TRAVEL TIME(MIN.) = 0.70
 Tc(MIN.) = 7.61
 SUBAREA AREA(ACRES) = 0.24 SUBAREA RUNOFF(CFS) = 0.82
 EFFECTIVE AREA(ACRES) = 2.46 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 8.39

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.13 FLOW VELOCITY(FEET/SEC.) = 4.16
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 12.00 = 879.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (ACRES)	Ae (ACRES)	HEADWATER NODE
1	8.38	6.04	4.335	0.20(0.02)	0.10	2.2	10.00
2	8.39	7.61	3.803	0.20(0.02)	0.10	2.5	11.50
3	7.94	12.05	2.932	0.20(0.02)	0.10	3.0	11.10

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 8.39 Tc(MIN.) = 7.61
 AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 2.46

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 7.61
 RAINFALL INTENSITY(INCH/HR) = 3.80
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.46
 TOTAL STREAM AREA(ACRES) = 3.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.39

FLOW PROCESS FROM NODE 12.10 TO NODE 12.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

```

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 270.00
ELEVATION DATA: UPSTREAM(FEET) = 58.00 DOWNSTREAM(FEET) = 54.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.626
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.113
SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/    SCS SOIL    AREA    Fp    Ap    SCS    Tc
    LAND USE          GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL              C      2.03    0.25    0.100    69    6.63
SUBAREA AVERAGE Pervious LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE Pervious AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 7.47
TOTAL AREA(ACRES) = 2.03 PEAK FLOW RATE(CFS) = 7.47

*****
FLOW PROCESS FROM NODE 12.20 TO NODE 12.30 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 45.00
FLOW LENGTH(FEET) = 200.00 MANNING'S N = 0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 38.04
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.47
PIPE TRAVEL TIME(MIN.) = 0.09 Tc(MIN.) = 6.71
LONGEST FLOWPATH FROM NODE 12.10 TO NODE 12.30 = 470.00 FEET.

*****
FLOW PROCESS FROM NODE 12.30 TO NODE 12.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 45.00 DOWNSTREAM(FEET) = 29.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00 CHANNEL SLOPE = 0.0457
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.735
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/    SCS SOIL    AREA    Fp    Ap    SCS
    LAND USE          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              D      1.26    0.20    0.100    75
SUBAREA AVERAGE Pervious LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE Pervious AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.58
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.11
AVERAGE FLOW DEPTH(FEET) = 0.12 TRAVEL TIME(MIN.) = 1.14
Tc(MIN.) = 7.86
SUBAREA AREA(ACRES) = 1.26 SUBAREA RUNOFF(CFS) = 4.21
EFFECTIVE AREA(ACRES) = 3.29 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.3 PEAK FLOW RATE(CFS) = 10.99

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.13 FLOW VELOCITY(FEET/SEC.) = 5.45
LONGEST FLOWPATH FROM NODE 12.10 TO NODE 12.00 = 820.00 FEET.

*****
FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS = 2

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CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:

TIME OF CONCENTRATION(MIN.) = 7.86
 RAINFALL INTENSITY(INCH/HR) = 3.74
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.23
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 3.29
 TOTAL STREAM AREA(ACRES) = 3.29
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.99

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.38	6.04	4.335	0.20(0.02)	0.10	2.2	10.00
1	8.39	7.61	3.803	0.20(0.02)	0.10	2.5	11.50
1	7.94	12.05	2.932	0.20(0.02)	0.10	3.0	11.10
2	10.99	7.86	3.735	0.23(0.02)	0.10	3.3	12.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	18.19	6.04	4.335	0.22(0.02)	0.10	4.7	10.00
2	19.23	7.61	3.803	0.22(0.02)	0.10	5.6	11.50
3	19.35	7.86	3.735	0.22(0.02)	0.10	5.8	12.10
4	16.55	12.05	2.932	0.22(0.02)	0.10	6.3	11.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 19.35 Tc(MIN.) = 7.86
 EFFECTIVE AREA(ACRES) = 5.78 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 6.3
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 12.00 = 879.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 29.00 DOWNSTREAM(FEET) = 26.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 134.00 CHANNEL SLOPE = 0.0224
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.634

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.80	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 20.65

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.71

AVERAGE FLOW DEPTH(FEET) = 0.24 TRAVEL TIME(MIN.) = 0.39

Tc(MIN.) = 8.25

SUBAREA AREA(ACRES) = 0.80 SUBAREA RUNOFF(CFS) = 2.60

EFFECTIVE AREA(ACRES) = 6.58 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 7.1 PEAK FLOW RATE(CFS) = 21.41

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.25 FLOW VELOCITY(FEET/SEC.) = 5.73

LONGEST FLOWPATH FROM NODE 11.10 TO NODE 13.00 = 1013.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
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1	20.54	6.44	4.182	0.21(0.02)	0.10	5.5	10.00
2	21.33	8.00	3.696	0.22(0.02)	0.10	6.4	11.50
3	21.41	8.25	3.634	0.22(0.02)	0.10	6.6	12.10
4	18.29	12.47	2.876	0.21(0.02)	0.10	7.1	11.10

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 21.41 Tc(MIN.) = 8.25

AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.22

AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 6.58

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+-----+
| SUBAREA B |
|           |
+-----+

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FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 122.00

ELEVATION DATA: UPSTREAM(FEET) = 30.00 DOWNSTREAM(FEET) = 15.00

 $T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.824

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.09	0.20	0.100	75	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.39

TOTAL AREA(ACRES) = 0.09 PEAK FLOW RATE(CFS) = 0.39

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+-----+
| SUBAREA C |
|           |
+-----+

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FLOW PROCESS FROM NODE 30.00 TO NODE 31.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 266.00

ELEVATION DATA: UPSTREAM(FEET) = 31.00 DOWNSTREAM(FEET) = 22.00

 $T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.870

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.030

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "8-10 DWELLINGS/ACRE"	D	0.69	0.20	0.400	75	6.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.400

SUBAREA RUNOFF(CFS) = 2.45

TOTAL AREA(ACRES) = 0.69 PEAK FLOW RATE(CFS) = 2.45

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+-----+
| SUBAREA D |
|           |
+-----+

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*****
FLOW PROCESS FROM NODE      40.00 TO NODE      41.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) =  278.00
ELEVATION DATA: UPSTREAM(FEET) =   54.00 DOWNSTREAM(FEET) =   31.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  11.038
* 25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.081
SUBAREA Tc AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
URBAN FAIR COVER
"TURF"                  C        2.13    0.25    1.000    77  11.04
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =    5.43
TOTAL AREA(ACRES) =    2.13  PEAK FLOW RATE(CFS) =    5.43

*****
FLOW PROCESS FROM NODE      41.00 TO NODE      42.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   29.00 DOWNSTREAM(FEET) =   21.40
FLOW LENGTH(FEET) =  218.00  MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =  15.55
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) =  8.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =    5.43
PIPE TRAVEL TIME(MIN.) =  0.23  Tc(MIN.) =  11.27
LONGEST FLOWPATH FROM NODE      40.00 TO NODE      42.00 =   496.00 FEET.

*****
FLOW PROCESS FROM NODE      42.00 TO NODE      42.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) =  11.27
* 25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.045
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
URBAN FAIR COVER
"TURF"                  D        1.25    0.20    1.000    82
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =  1.25  SUBAREA RUNOFF(CFS) =  3.20
EFFECTIVE AREA(ACRES) =  3.38  AREA-AVERAGED Fm(INCH/HR) =  0.23
AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
TOTAL AREA(ACRES) =  3.4  PEAK FLOW RATE(CFS) =  8.56

*****
FLOW PROCESS FROM NODE      42.00 TO NODE      43.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =   21.40 DOWNSTREAM(FEET) =   18.00
FLOW LENGTH(FEET) =  354.00  MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =  24.52
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)

```

GIVEN PIPE DIAMETER(INCH) = 8.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 8.56
 PIPE TRAVEL TIME(MIN.) = 0.24 Tc(MIN.) = 11.51
 LONGEST FLOWPATH FROM NODE 40.00 TO NODE 43.00 = 850.00 FEET.

```

+-----+
| SUBAREA E |
+-----+

```

 FLOW PROCESS FROM NODE 50.00 TO NODE 51.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 150.00
 ELEVATION DATA: UPSTREAM(FEET) = 27.00 DOWNSTREAM(FEET) = 18.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.196
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.417
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
URBAN FAIR COVER "TURF"	D	0.36	0.20	1.000	82	9.20

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 1.04
 TOTAL AREA(ACRES) = 0.36 PEAK FLOW RATE(CFS) = 1.04

 FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 18.00 DOWNSTREAM(FEET) = 17.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 161.00 CHANNEL SLOPE = 0.0062
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.074
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER "TURF"	D	0.72	0.20	1.000	82

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 1.98
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.42
 AVERAGE FLOW DEPTH(FEET) = 0.25 TRAVEL TIME(MIN.) = 1.88
 Tc(MIN.) = 11.08
 SUBAREA AREA(ACRES) = 0.72 SUBAREA RUNOFF(CFS) = 1.86
 EFFECTIVE AREA(ACRES) = 1.08 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 1.1 PEAK FLOW RATE(CFS) = 2.79

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.30 FLOW VELOCITY(FEET/SEC.) = 1.61
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 311.00 FEET.

 FLOW PROCESS FROM NODE 52.00 TO NODE 52.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 =====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 11.08
 RAINFALL INTENSITY(INCH/HR) = 3.07
 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 1.00
 EFFECTIVE STREAM AREA(ACRES) = 1.08
 TOTAL STREAM AREA(ACRES) = 1.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.79

 FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
 ELEVATION DATA: UPSTREAM(FEET) = 54.00 DOWNSTREAM(FEET) = 37.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 12.996
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.809
 SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	T_c (MIN.)
URBAN FAIR COVER "TURF"	C	1.20	0.25	1.000	77	13.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 2.76
 TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 2.76

 FLOW PROCESS FROM NODE 54.00 TO NODE 55.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 37.00 DOWNSTREAM(FEET) = 32.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 204.00 CHANNEL SLOPE = 0.0245
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.630
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER "TURF"	C	1.80	0.25	1.000	77

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.69
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.12
 AVERAGE FLOW DEPTH(FEET) = 0.15 TRAVEL TIME(MIN.) = 1.61
 T_c (MIN.) = 14.60
 SUBAREA AREA(ACRES) = 1.80 SUBAREA RUNOFF(CFS) = 3.86
 EFFECTIVE AREA(ACRES) = 3.00 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 6.43

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.18 FLOW VELOCITY(FEET/SEC.) = 2.40
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 55.00 = 534.00 FEET.

 FLOW PROCESS FROM NODE 55.00 TO NODE 56.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 32.00 DOWNSTREAM(FEET) = 19.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 261.00 CHANNEL SLOPE = 0.0479
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.501
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/  SCS SOIL  AREA      Fp      Ap      SCS
    LAND USE        GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
URBAN FAIR COVER
"TURF"              D        1.35    0.20    1.000    82
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 1.000
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.82
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.20
AVERAGE FLOW DEPTH(FEET) = 0.16 TRAVEL TIME(MIN.) = 1.36
Tc(MIN.) = 15.96
SUBAREA AREA(ACRES) = 1.35 SUBAREA RUNOFF(CFS) = 2.80
EFFECTIVE AREA(ACRES) = 4.35 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 4.3 PEAK FLOW RATE(CFS) = 8.87

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.18 FLOW VELOCITY(FEET/SEC.) = 3.32
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 56.00 = 795.00 FEET.

*****
FLOW PROCESS FROM NODE 56.00 TO NODE 52.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 19.50 DOWNSTREAM(FEET) = 17.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 110.00 CHANNEL SLOPE = 0.0227
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 8.87
FLOW VELOCITY(FEET/SEC.) = 2.71 FLOW DEPTH(FEET) = 0.22
TRAVEL TIME(MIN.) = 0.68 Tc(MIN.) = 16.64
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 52.00 = 905.00 FEET.

*****
FLOW PROCESS FROM NODE 52.00 TO NODE 52.00 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.) = 16.64
RAINFALL INTENSITY(INCH/HR) = 2.44
AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.23
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 4.35
TOTAL STREAM AREA(ACRES) = 4.35
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.87

** CONFLUENCE DATA **
  STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER    (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES)  (ACRES)  NODE
      1      2.79  11.08   3.074  0.20( 0.20) 1.00     1.1    50.00
      2      8.87  16.64   2.442  0.23( 0.23) 1.00     4.3    53.00

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

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

```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	10.39	11.08	3.074	0.23(0.23)	1.00	50.00
2	11.05	16.64	2.442	0.23(0.23)	1.00	53.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 11.05 Tc(MIN.) = 16.64
 EFFECTIVE AREA(ACRES) = 5.43 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 5.4
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 52.00 = 905.00 FEET.

FLOW PROCESS FROM NODE 52.00 TO NODE 57.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

ELEVATION DATA: UPSTREAM(FEET) = 17.00 DOWNSTREAM(FEET) = 16.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 253.00 CHANNEL SLOPE = 0.0040

CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.298

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER					

"TURF"	D	1.44	0.20	1.000	82
--------	---	------	------	-------	----

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.41

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.22

AVERAGE FLOW DEPTH(FEET) = 0.80 TRAVEL TIME(MIN.) = 1.90

Tc(MIN.) = 18.54

SUBAREA AREA(ACRES) = 1.44 SUBAREA RUNOFF(CFS) = 2.72

EFFECTIVE AREA(ACRES) = 6.87 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 12.84

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.81 FLOW VELOCITY(FEET/SEC.) = 2.24

LONGEST FLOWPATH FROM NODE 53.00 TO NODE 57.00 = 1158.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (ACRES)	Ae (ACRES)	HEADWATER NODE
1	12.63	13.00	2.809	0.22(0.22)	1.00	5.4	50.00
2	12.84	18.54	2.298	0.22(0.22)	1.00	6.9	53.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 12.84 Tc(MIN.) = 18.54

AREA-AVERAGED Fm(INCH/HR) = 0.22 AREA-AVERAGED Fp(INCH/HR) = 0.22

AREA-AVERAGED Ap = 1.00 EFFECTIVE AREA(ACRES) = 6.87

FLOW PROCESS FROM NODE 57.00 TO NODE 58.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

ELEVATION DATA: UPSTREAM(FEET) = 16.00 DOWNSTREAM(FEET) = 15.50

CHANNEL LENGTH THRU SUBAREA(FEET) = 107.00 CHANNEL SLOPE = 0.0047

CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500

MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.248

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER					

"TURF"	D	1.22	0.20	1.000	82
--------	---	------	------	-------	----

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 13.96
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/Sec.) = 2.44
 AVERAGE FLOW DEPTH(Feet) = 0.81 TRAVEL TIME(Min.) = 0.73
 $T_c(\text{Min.}) = 19.27$
 SUBAREA AREA(ACRES) = 1.22 SUBAREA RUNOFF(CFS) = 2.25
 EFFECTIVE AREA(ACRES) = 8.09 AREA-AVERAGED $F_m(\text{Inch/HR}) = 0.22$
 AREA-AVERAGED $F_p(\text{Inch/HR}) = 0.22$ AREA-AVERAGED $A_p = 1.00$
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 14.78

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(Feet) = 0.84 FLOW VELOCITY(Feet/Sec.) = 2.47
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 58.00 = 1265.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (Min.)	Intensity (Inch/HR)	$F_p(F_m)$ (Inch/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	14.98	13.73	2.723	0.22(0.22)	1.00	6.6	50.00
2	14.78	19.27	2.248	0.22(0.22)	1.00	8.1	53.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 14.98 $T_c(\text{Min.}) = 13.73$
 AREA-AVERAGED $F_m(\text{Inch/HR}) = 0.22$ AREA-AVERAGED $F_p(\text{Inch/HR}) = 0.22$
 AREA-AVERAGED $A_p = 1.00$ EFFECTIVE AREA(ACRES) = 6.64

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.1 $T_c(\text{Min.}) = 13.73$
 EFFECTIVE AREA(ACRES) = 6.64 AREA-AVERAGED $F_m(\text{Inch/HR}) = 0.22$
 AREA-AVERAGED $F_p(\text{Inch/HR}) = 0.22$ AREA-AVERAGED $A_p = 1.000$
 PEAK FLOW RATE(CFS) = 14.98

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (Min.)	Intensity (Inch/HR)	$F_p(F_m)$ (Inch/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	14.98	13.73	2.723	0.22(0.22)	1.00	6.6	50.00
2	14.78	19.27	2.248	0.22(0.22)	1.00	8.1	53.00

END OF RATIONAL METHOD ANALYSIS

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

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Analysis prepared by:

Fuscoe Engineering, Inc.
15535 Sand Canyon Ave.
Suite 100
Irvine, CA 92618

```

***** DESCRIPTION OF STUDY *****
* SNUG HARBOR *
* EXISTING CONDITION *
* 100 YR *
*****

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FILE NAME: SNUG2EX.DAT
TIME/DATE OF STUDY: 16:51 08/06/2024

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

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

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH LIP HIKE (FT) (FT) (FT)	MANNING FACTOR (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.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

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+-----+
| SUBAREA A |
|           |
+-----+

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*****
FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 33.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.339

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.959

SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
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COMMERCIAL          D          0.88      0.20      0.100      91      5.34
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 4.70
TOTAL AREA(ACRES) = 0.88 PEAK FLOW RATE(CFS) = 4.70

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*****
FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 IS CODE = 1
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>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
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TOTAL NUMBER OF STREAMS = 3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 5.34
RAINFALL INTENSITY(INCH/HR) = 5.96
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.88
TOTAL STREAM AREA(ACRES) = 0.88
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.70

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*****
FLOW PROCESS FROM NODE 11.10 TO NODE 11.20 IS CODE = 21
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>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
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INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 63.00 DOWNSTREAM(FEET) = 62.00

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Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.862
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.192
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/   SCS SOIL   AREA      Fp      Ap      SCS   Tc
LAND USE           GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL          D        0.67      0.20      0.100      91    9.86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 2.52
TOTAL AREA(ACRES) = 0.67 PEAK FLOW RATE(CFS) = 2.52

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*****
FLOW PROCESS FROM NODE 11.20 TO NODE 11.30 IS CODE = 91
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>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
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UPSTREAM NODE ELEVATION(FEET) = 62.00
DOWNSTREAM NODE ELEVATION(FEET) = 55.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 173.00
"V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.160
PAVEMENT LIP(FEET) = 0.010 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 10.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.047
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/   SCS SOIL   AREA      Fp      Ap      SCS
LAND USE           GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          D        0.78      0.20      0.100      91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 3.93
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.60
AVERAGE FLOW DEPTH(FEET) = 0.25 FLOOD WIDTH(FEET) = 11.22
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.63 Tc(MIN.) = 10.49
SUBAREA AREA(ACRES) = 0.78 SUBAREA RUNOFF(CFS) = 2.83
EFFECTIVE AREA(ACRES) = 1.45 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

```

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 5.26

END OF SUBAREA "V" GUTTER HYDRAULICS:

DEPTH(FEET) = 0.27 FLOOD WIDTH(FEET) = 13.26
 FLOW VELOCITY(FEET/SEC.) = 4.76 DEPTH*VELOCITY(FT*FT/SEC) = 1.30
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.30 = 503.00 FEET.

FLOW PROCESS FROM NODE 11.30 TO NODE 11.40 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 38.00
 FLOW LENGTH(FEET) = 52.00 MANNING'S N = 0.015
 DEPTH OF FLOW IN 36.0 INCH PIPE IS 3.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 16.65
 GIVEN PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 5.26
 PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 10.54
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.40 = 555.00 FEET.

FLOW PROCESS FROM NODE 11.40 TO NODE 11.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 38.00 DOWNSTREAM(FEET) = 33.50
 CHANNEL LENGTH THRU SUBAREA(FEET) = 150.00 CHANNEL SLOPE = 0.0300
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 CHANNEL FLOW THRU SUBAREA(CFS) = 5.26
 FLOW VELOCITY(FEET/SEC.) = 3.64 FLOW DEPTH(FEET) = 0.10
 TRAVEL TIME(MIN.) = 0.69 Tc(MIN.) = 11.23
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.00 = 705.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 11.23
 RAINFALL INTENSITY(INCH/HR) = 3.89
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 1.45
 TOTAL STREAM AREA(ACRES) = 1.45
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.26

FLOW PROCESS FROM NODE 11.50 TO NODE 11.60 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 265.00
 ELEVATION DATA: UPSTREAM(FEET) = 62.00 DOWNSTREAM(FEET) = 55.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.859

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.650

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.46	0.20	0.100	91	5.86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.20$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA RUNOFF(CFS) = 2.33
 TOTAL AREA(ACRES) = 0.46 PEAK FLOW RATE(CFS) = 2.33

 FLOW PROCESS FROM NODE 11.60 TO NODE 11.70 IS CODE = 41

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) =	53.00	DOWNSTREAM(Feet) =	38.00
FLOW LENGTH(Feet) =	52.00	MANNING'S N =	0.013
DEPTH OF FLOW IN	6.0 INCH PIPE IS	4.1 INCHES	
PIPE-FLOW VELOCITY(Feet/Sec.) =	16.25		
GIVEN PIPE DIAMETER(INCH) =	6.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	2.33		
PIPE TRAVEL TIME(MIN.) =	0.05	$T_c(\text{MIN.}) =$	5.91
LONGEST FLOWPATH FROM NODE	11.50 TO NODE	11.70 =	317.00 FEET.

 FLOW PROCESS FROM NODE 11.70 TO NODE 11.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) =	38.00	DOWNSTREAM(Feet) =	33.50
CHANNEL LENGTH THRU SUBAREA(Feet) =	143.00	CHANNEL SLOPE =	0.0315
CHANNEL BASE(Feet) =	15.00	"Z" FACTOR =	0.000
MANNING'S FACTOR =	0.015	MAXIMUM DEPTH(Feet) =	10.00
CHANNEL FLOW THRU SUBAREA(CFS) =	2.33		
FLOW VELOCITY(Feet/Sec.) =	2.67	FLOW DEPTH(Feet) =	0.06
TRAVEL TIME(MIN.) =	0.89	$T_c(\text{MIN.}) =$	6.80
LONGEST FLOWPATH FROM NODE	11.50 TO NODE	11.00 =	460.00 FEET.

 FLOW PROCESS FROM NODE 11.00 TO NODE 11.00 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.) = 6.80
 RAINFALL INTENSITY(INCH/HR) = 5.19
 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.02$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.20$
 AREA-AVERAGED $A_p = 0.10$
 EFFECTIVE STREAM AREA(ACRES) = 0.46
 TOTAL STREAM AREA(ACRES) = 0.46
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.33

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	4.70	5.34	5.959	0.20(0.02)	0.10	0.9	10.00
2	5.26	11.23	3.892	0.20(0.02)	0.10	1.5	11.10
3	2.33	6.80	5.186	0.20(0.02)	0.10	0.5	11.50

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	10.64	5.34	5.959	0.20(0.02)	0.10	1.9	10.00
2	10.67	6.80	5.186	0.20(0.02)	0.10	2.2	11.50
3	10.07	11.23	3.892	0.20(0.02)	0.10	2.8	11.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 10.67 Tc(MIN.) = 6.80
 EFFECTIVE AREA(ACRES) = 2.22 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 2.8
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 11.00 = 705.00 FEET.

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 33.50 DOWNSTREAM(FEET) = 29.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 174.00 CHANNEL SLOPE = 0.0259
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.928
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.24	0.20	0.100	91

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 11.20
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.58
 AVERAGE FLOW DEPTH(FEET) = 0.16 TRAVEL TIME(MIN.) = 0.63
 Tc(MIN.) = 7.44
 SUBAREA AREA(ACRES) = 0.24 SUBAREA RUNOFF(CFS) = 1.06
 EFFECTIVE AREA(ACRES) = 2.46 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 10.86

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.16 FLOW VELOCITY(FEET/SEC.) = 4.60
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 12.00 = 879.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (INCH/HR)	Ae (ACRES)	HEADWATER NODE
1	10.88	5.97	5.589	0.20(0.02)	0.10	2.2	10.00
2	10.86	7.44	4.928	0.20(0.02)	0.10	2.5	11.50
3	10.22	11.87	3.769	0.20(0.02)	0.10	3.0	11.10

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 10.88 Tc(MIN.) = 5.97
 AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 2.17

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 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.) = 5.97
 RAINFALL INTENSITY(INCH/HR) = 5.59
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 2.17
 TOTAL STREAM AREA(ACRES) = 3.03
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.88

FLOW PROCESS FROM NODE 12.10 TO NODE 12.20 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

```

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 270.00
ELEVATION DATA: UPSTREAM(FEET) = 58.00 DOWNSTREAM(FEET) = 54.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.626
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.265
SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/    SCS SOIL    AREA    Fp    Ap    SCS    Tc
    LAND USE          GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL              C      2.03    0.25    0.100    86    6.63
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 9.57
TOTAL AREA(ACRES) = 2.03 PEAK FLOW RATE(CFS) = 9.57

*****
FLOW PROCESS FROM NODE 12.20 TO NODE 12.30 IS CODE = 41
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 52.00 DOWNSTREAM(FEET) = 45.00
FLOW LENGTH(FEET) = 200.00 MANNING'S N = 0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) = 48.76
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 9.57
PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 6.69
LONGEST FLOWPATH FROM NODE 12.10 TO NODE 12.30 = 470.00 FEET.

*****
FLOW PROCESS FROM NODE 12.30 TO NODE 12.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 45.00 DOWNSTREAM(FEET) = 29.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 350.00 CHANNEL SLOPE = 0.0457
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.829
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/    SCS SOIL    AREA    Fp    Ap    SCS
    LAND USE          GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              D      1.26    0.20    0.100    91
SUBAREA AVERAGE PVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.30
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 5.77
AVERAGE FLOW DEPTH(FEET) = 0.14 TRAVEL TIME(MIN.) = 1.01
Tc(MIN.) = 7.71
SUBAREA AREA(ACRES) = 1.26 SUBAREA RUNOFF(CFS) = 5.45
EFFECTIVE AREA(ACRES) = 3.29 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.3 PEAK FLOW RATE(CFS) = 14.23

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.16 FLOW VELOCITY(FEET/SEC.) = 6.03
LONGEST FLOWPATH FROM NODE 12.10 TO NODE 12.00 = 820.00 FEET.

*****
FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 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.) = 7.71
 RAINFALL INTENSITY(INCH/HR) = 4.83
 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.23
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 3.29
 TOTAL STREAM AREA(ACRES) = 3.29
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 14.23

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.88	5.97	5.589	0.20(0.02)	0.10	2.2	10.00
1	10.86	7.44	4.928	0.20(0.02)	0.10	2.5	11.50
1	10.22	11.87	3.769	0.20(0.02)	0.10	3.0	11.10
2	14.23	7.71	4.829	0.23(0.02)	0.10	3.3	12.10

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	23.65	5.97	5.589	0.22(0.02)	0.10	4.7	10.00
2	24.88	7.44	4.928	0.22(0.02)	0.10	5.6	11.50
3	25.05	7.71	4.829	0.22(0.02)	0.10	5.8	12.10
4	21.32	11.87	3.769	0.22(0.02)	0.10	6.3	11.10

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 25.05 Tc(MIN.) = 7.71
 EFFECTIVE AREA(ACRES) = 5.78 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 6.3
 LONGEST FLOWPATH FROM NODE 11.10 TO NODE 12.00 = 879.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 29.00 DOWNSTREAM(FEET) = 26.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 134.00 CHANNEL SLOPE = 0.0224
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.705

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.80	0.20	0.100	91

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 26.74

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 6.25

AVERAGE FLOW DEPTH(FEET) = 0.29 TRAVEL TIME(MIN.) = 0.36

Tc(MIN.) = 8.06

SUBAREA AREA(ACRES) = 0.80 SUBAREA RUNOFF(CFS) = 3.37

EFFECTIVE AREA(ACRES) = 6.58 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 7.1 PEAK FLOW RATE(CFS) = 27.75

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.29 FLOW VELOCITY(FEET/SEC.) = 6.32

LONGEST FLOWPATH FROM NODE 11.10 TO NODE 13.00 = 1013.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
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1	26.74	6.33	5.403	0.21(0.02)	0.10	5.5	10.00
2	27.65	7.80	4.797	0.22(0.02)	0.10	6.4	11.50
3	27.75	8.06	4.705	0.22(0.02)	0.10	6.6	12.10
4	23.58	12.25	3.702	0.21(0.02)	0.10	7.1	11.10

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 27.75 Tc(MIN.) = 8.06

AREA-AVERAGED Fm(INCH/HR) = 0.02 AREA-AVERAGED Fp(INCH/HR) = 0.22

AREA-AVERAGED Ap = 0.10 EFFECTIVE AREA(ACRES) = 6.58

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+-----+
| SUBAREA B                                     |
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FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 122.00

ELEVATION DATA: UPSTREAM(FEET) = 30.00 DOWNSTREAM(FEET) = 15.00

 $T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 6.187

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.09	0.20	0.100	91	5.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 0.50

TOTAL AREA(ACRES) = 0.09 PEAK FLOW RATE(CFS) = 0.50

```

+-----+
| SUBAREA C                                     |
|-----|

```

FLOW PROCESS FROM NODE 30.00 TO NODE 31.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 266.00

ELEVATION DATA: UPSTREAM(FEET) = 31.00 DOWNSTREAM(FEET) = 22.00

 $T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.870

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.157

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
RESIDENTIAL "8-10 DWELLINGS/ACRE"	D	0.69	0.20	0.400	91	6.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.400

SUBAREA RUNOFF(CFS) = 3.15

TOTAL AREA(ACRES) = 0.69 PEAK FLOW RATE(CFS) = 3.15

```

+-----+
| SUBAREA D                                     |
|-----|

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```

*****
FLOW PROCESS FROM NODE      40.00 TO NODE      41.00 IS CODE =  21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) =  278.00
ELEVATION DATA: UPSTREAM(FEET) =    54.00 DOWNSTREAM(FEET) =    31.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  11.038
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.930
SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
    LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
URBAN FAIR COVER
"TURF"                  C        2.13    0.25    1.000    92  11.04
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA RUNOFF(CFS) =    7.06
TOTAL AREA(ACRES) =    2.13  PEAK FLOW RATE(CFS) =    7.06

*****
FLOW PROCESS FROM NODE      41.00 TO NODE      42.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  29.00 DOWNSTREAM(FEET) =  21.40
FLOW LENGTH(FEET) =  218.00  MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =  20.21
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
GIVEN PIPE DIAMETER(INCH) =  8.00  NUMBER OF PIPES =  1
PIPE-FLOW(CFS) =    7.06
PIPE TRAVEL TIME(MIN.) =  0.18  Tc(MIN.) =  11.22
LONGEST FLOWPATH FROM NODE    40.00 TO NODE    42.00 =    496.00 FEET.

*****
FLOW PROCESS FROM NODE      42.00 TO NODE      42.00 IS CODE =  81
-----
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
=====
MAINLINE Tc(MIN.) =  11.22
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.894
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
    LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
URBAN FAIR COVER
"TURF"                  D        1.25    0.20    1.000    95
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
SUBAREA AREA(ACRES) =  1.25  SUBAREA RUNOFF(CFS) =    4.16
EFFECTIVE AREA(ACRES) =  3.38  AREA-AVERAGED Fm(INCH/HR) =  0.23
AREA-AVERAGED Fp(INCH/HR) =  0.23  AREA-AVERAGED Ap =  1.00
TOTAL AREA(ACRES) =    3.4  PEAK FLOW RATE(CFS) =    11.14

*****
FLOW PROCESS FROM NODE      42.00 TO NODE      43.00 IS CODE =  41
-----
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =  21.40 DOWNSTREAM(FEET) =  18.00
FLOW LENGTH(FEET) =  354.00  MANNING'S N =  0.013
ASSUME FULL-FLOWING PIPELINE
PIPE-FLOW VELOCITY(FEET/SEC.) =  31.92
PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)

```

GIVEN PIPE DIAMETER(INCH) = 8.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 11.14
 PIPE TRAVEL TIME(MIN.) = 0.18 Tc(MIN.) = 11.40
 LONGEST FLOWPATH FROM NODE 40.00 TO NODE 43.00 = 850.00 FEET.

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+-----+
| SUBAREA E |
|           |
+-----+

```

 FLOW PROCESS FROM NODE 50.00 TO NODE 51.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
 =====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 150.00
 ELEVATION DATA: UPSTREAM(FEET) = 27.00 DOWNSTREAM(FEET) = 18.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.196
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.364
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
URBAN FAIR COVER "TURF"	D	0.36	0.20	1.000	95	9.20

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 1.35
 TOTAL AREA(ACRES) = 0.36 PEAK FLOW RATE(CFS) = 1.35

 FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
 =====

ELEVATION DATA: UPSTREAM(FEET) = 18.00 DOWNSTREAM(FEET) = 17.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 161.00 CHANNEL SLOPE = 0.0062
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.957
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER "TURF"	D	0.72	0.20	1.000	95

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.57
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 1.56
 AVERAGE FLOW DEPTH(FEET) = 0.29 TRAVEL TIME(MIN.) = 1.71
 Tc(MIN.) = 10.91
 SUBAREA AREA(ACRES) = 0.72 SUBAREA RUNOFF(CFS) = 2.43
 EFFECTIVE AREA(ACRES) = 1.08 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 1.1 PEAK FLOW RATE(CFS) = 3.65

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.35 FLOW VELOCITY(FEET/SEC.) = 1.75
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 311.00 FEET.

 FLOW PROCESS FROM NODE 52.00 TO NODE 52.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 =====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
 TIME OF CONCENTRATION(MIN.) = 10.91
 RAINFALL INTENSITY(INCH/HR) = 3.96
 AREA-AVERAGED Fm(INCH/HR) = 0.20
 AREA-AVERAGED Fp(INCH/HR) = 0.20
 AREA-AVERAGED Ap = 1.00
 EFFECTIVE STREAM AREA(ACRES) = 1.08
 TOTAL STREAM AREA(ACRES) = 1.08
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.65

 FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
 ELEVATION DATA: UPSTREAM(FEET) = 54.00 DOWNSTREAM(FEET) = 37.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.996
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.579
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
URBAN FAIR COVER "TURF"	C	1.20	0.25	1.000	92	13.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 SUBAREA RUNOFF(CFS) = 3.60
 TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 3.60

 FLOW PROCESS FROM NODE 54.00 TO NODE 55.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 37.00 DOWNSTREAM(FEET) = 32.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 204.00 CHANNEL SLOPE = 0.0245
 CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.371
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER "TURF"	C	1.80	0.25	1.000	92

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.13
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.37
 AVERAGE FLOW DEPTH(FEET) = 0.17 TRAVEL TIME(MIN.) = 1.44
 Tc(MIN.) = 14.43
 SUBAREA AREA(ACRES) = 1.80 SUBAREA RUNOFF(CFS) = 5.06
 EFFECTIVE AREA(ACRES) = 3.00 AREA-AVERAGED Fm(INCH/HR) = 0.25
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 3.0 PEAK FLOW RATE(CFS) = 8.43

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.21 FLOW VELOCITY(FEET/SEC.) = 2.69
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 55.00 = 534.00 FEET.

 FLOW PROCESS FROM NODE 55.00 TO NODE 56.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 32.00 DOWNSTREAM(FEET) = 19.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 261.00 CHANNEL SLOPE = 0.0479
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.216
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/  SCS SOIL  AREA    Fp      Ap    SCS
    LAND USE        GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
URBAN FAIR COVER
"TURF"              D        1.35    0.20    1.000  95
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 10.26
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.53
AVERAGE FLOW DEPTH(FEET) = 0.19 TRAVEL TIME(MIN.) = 1.23
Tc(MIN.) = 15.66
SUBAREA AREA(ACRES) = 1.35 SUBAREA RUNOFF(CFS) = 3.66
EFFECTIVE AREA(ACRES) = 4.35 AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.00
TOTAL AREA(ACRES) = 4.3 PEAK FLOW RATE(CFS) = 11.67

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) = 0.21 FLOW VELOCITY(FEET/SEC.) = 3.73
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 56.00 = 795.00 FEET.

*****
FLOW PROCESS FROM NODE 56.00 TO NODE 52.00 IS CODE = 51
-----
>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 19.50 DOWNSTREAM(FEET) = 17.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 110.00 CHANNEL SLOPE = 0.0227
CHANNEL BASE(FEET) = 15.00 "Z" FACTOR = 0.000
MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
CHANNEL FLOW THRU SUBAREA(CFS) = 11.67
FLOW VELOCITY(FEET/SEC.) = 2.97 FLOW DEPTH(FEET) = 0.26
TRAVEL TIME(MIN.) = 0.62 Tc(MIN.) = 16.28
LONGEST FLOWPATH FROM NODE 53.00 TO NODE 52.00 = 905.00 FEET.

*****
FLOW PROCESS FROM NODE 52.00 TO NODE 52.00 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.) = 16.28
RAINFALL INTENSITY(INCH/HR) = 3.15
AREA-AVERAGED Fm(INCH/HR) = 0.23
AREA-AVERAGED Fp(INCH/HR) = 0.23
AREA-AVERAGED Ap = 1.00
EFFECTIVE STREAM AREA(ACRES) = 4.35
TOTAL STREAM AREA(ACRES) = 4.35
PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.67

** CONFLUENCE DATA **
  STREAM    Q    Tc  Intensity  Fp(Fm)    Ap    Ae  HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES)  NODE
    1      3.65  10.91   3.957  0.20( 0.20) 1.00    1.1   50.00
    2     11.67  16.28   3.146  0.23( 0.23) 1.00    4.3   53.00

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

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

```

NUMBER	(CFS)	(MIN.)	(INCH/HR)	(INCH/HR)	(ACRES)	NODE
1	13.65	10.91	3.957	0.23(0.23)	1.00	50.00
2	14.54	16.28	3.146	0.23(0.23)	1.00	53.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 14.54 Tc(MIN.) = 16.28
 EFFECTIVE AREA(ACRES) = 5.43 AREA-AVERAGED Fm(INCH/HR) = 0.23
 AREA-AVERAGED Fp(INCH/HR) = 0.23 AREA-AVERAGED Ap = 1.00
 TOTAL AREA(ACRES) = 5.4
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 52.00 = 905.00 FEET.

FLOW PROCESS FROM NODE 52.00 TO NODE 57.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

ELEVATION DATA: UPSTREAM(FEET) = 17.00 DOWNSTREAM(FEET) = 16.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 253.00 CHANNEL SLOPE = 0.0040
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.966

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER					

"TURF"	D	1.44	0.20	1.000	95
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SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 16.33

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.40

AVERAGE FLOW DEPTH(FEET) = 0.93 TRAVEL TIME(MIN.) = 1.75

Tc(MIN.) = 18.04

SUBAREA AREA(ACRES) = 1.44 SUBAREA RUNOFF(CFS) = 3.59

EFFECTIVE AREA(ACRES) = 6.87 AREA-AVERAGED Fm(INCH/HR) = 0.22

AREA-AVERAGED Fp(INCH/HR) = 0.22 AREA-AVERAGED Ap = 1.00

TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 16.97

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.95 FLOW VELOCITY(FEET/SEC.) = 2.43

LONGEST FLOWPATH FROM NODE 53.00 TO NODE 57.00 = 1158.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap (ACRES)	Ae (ACRES)	HEADWATER NODE
1	16.69	12.68	3.631	0.22(0.22)	1.00	5.4	50.00
2	16.97	18.04	2.966	0.22(0.22)	1.00	6.9	53.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 16.97 Tc(MIN.) = 18.04

AREA-AVERAGED Fm(INCH/HR) = 0.22 AREA-AVERAGED Fp(INCH/HR) = 0.22

AREA-AVERAGED Ap = 1.00 EFFECTIVE AREA(ACRES) = 6.87

FLOW PROCESS FROM NODE 57.00 TO NODE 58.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

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

ELEVATION DATA: UPSTREAM(FEET) = 16.00 DOWNSTREAM(FEET) = 15.50
 CHANNEL LENGTH THRU SUBAREA(FEET) = 107.00 CHANNEL SLOPE = 0.0047
 CHANNEL BASE(FEET) = 5.00 "Z" FACTOR = 2.500
 MANNING'S FACTOR = 0.030 MAXIMUM DEPTH(FEET) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.905

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
URBAN FAIR COVER					

"TURF"	D	1.22	0.20	1.000	95
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SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 1.000$
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 18.45
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.64
 AVERAGE FLOW DEPTH(FEET) = 0.95 TRAVEL TIME(MIN.) = 0.68
 $T_c(\text{MIN.}) = 18.71$
 SUBAREA AREA(ACRES) = 1.22 SUBAREA RUNOFF(CFS) = 2.97
 EFFECTIVE AREA(ACRES) = 8.09 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.22$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.22$ AREA-AVERAGED $A_p = 1.00$
 TOTAL AREA(ACRES) = 8.1 PEAK FLOW RATE(CFS) = 19.56

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) = 0.98 FLOW VELOCITY(FEET/SEC.) = 2.68
 LONGEST FLOWPATH FROM NODE 53.00 TO NODE 58.00 = 1265.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	19.82	13.35	3.525	0.22(0.22)	1.00	6.7	50.00
2	19.56	18.71	2.905	0.22(0.22)	1.00	8.1	53.00

NEW PEAK FLOW DATA ARE:

PEAK FLOW RATE(CFS) = 19.82 $T_c(\text{MIN.}) = 13.35$
 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.22$ AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.22$
 AREA-AVERAGED $A_p = 1.00$ EFFECTIVE AREA(ACRES) = 6.65

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.1 $T_c(\text{MIN.}) = 13.35$
 EFFECTIVE AREA(ACRES) = 6.65 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.22$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.22$ AREA-AVERAGED $A_p = 1.000$
 PEAK FLOW RATE(CFS) = 19.82

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	T_c (MIN.)	Intensity (INCH/HR)	$F_p(F_m)$ (INCH/HR)	A_p	A_e (ACRES)	HEADWATER NODE
1	19.82	13.35	3.525	0.22(0.22)	1.00	6.7	50.00
2	19.56	18.71	2.905	0.22(0.22)	1.00	8.1	53.00

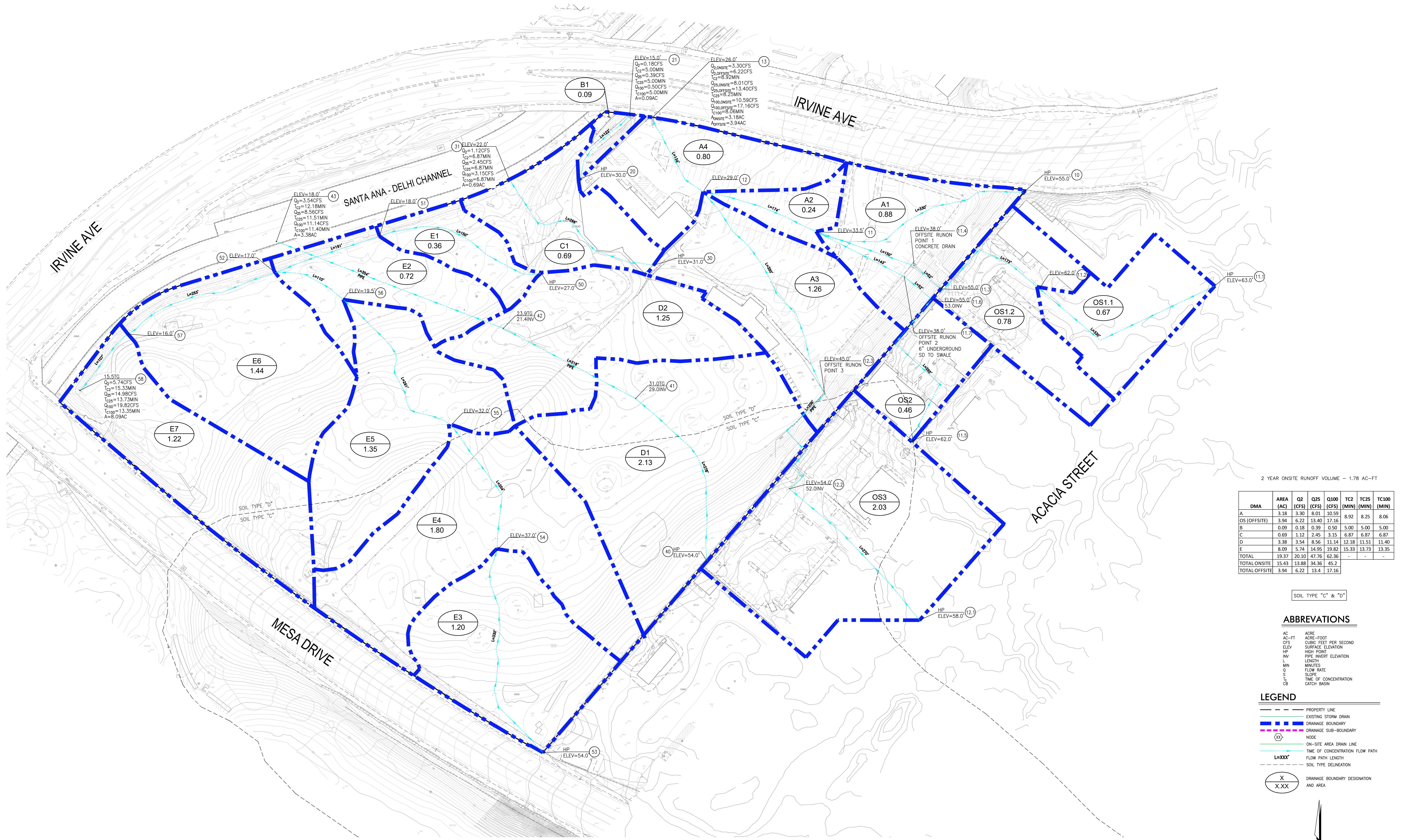
END OF RATIONAL METHOD ANALYSIS

↑

Appendix 5

Existing Condition Hydrology Map

EXISTING CONDITION HYDROLOGY



2 YEAR ONSITE RUNOFF VOLUME = 1.78 AC-FT

DMA	AREA (AC)	Q2 (CFS)	Q25 (CFS)	Q100 (CFS)	TC2 (MIN)	TC25 (MIN)	TC100 (MIN)
A	3.18	3.30	8.01	10.59	8.92	8.25	8.06
OS (OFFSITE)	3.94	6.22	13.40	17.16	-	-	-
B	0.09	0.18	0.39	0.50	5.00	5.00	5.00
C	0.69	1.12	2.45	3.15	6.87	6.87	6.87
D	3.38	3.54	8.56	11.14	12.18	11.51	11.40
E	8.09	5.74	14.95	19.82	15.33	13.73	13.35
TOTAL	19.37	20.10	47.76	62.36	-	-	-
TOTAL ONSITE	15.43	13.88	34.36	45.2	-	-	-
TOTAL OFFSITE	3.94	6.22	13.4	17.16	-	-	-

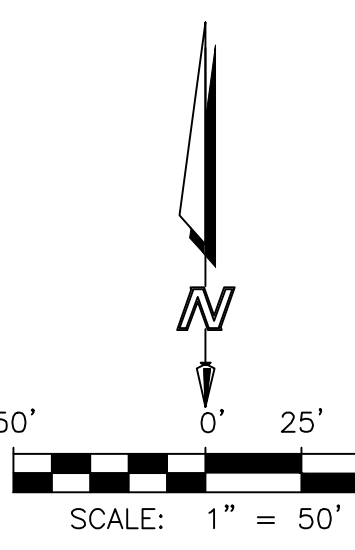
SOIL TYPE "C" & "D"

ABBREVIATIONS

AC ACRE
AC-FT ACRE-FOOT
CFS CUBIC FEET PER SECOND
ELEV SURFACE ELEVATION
HP HIGH POINT
INV PIPE INVERT ELEVATION
L LENGTH
MIN MINUTES
Q FLOW RATE
S SLOPE
TC TIME OF CONCENTRATION
CB CATCH BASIN

LEGEND

- PROPERTY LINE
- EXISTING STORM DRAIN
- DRAINAGE BOUNDARY
- DRAINAGE SUB-BOUNDARY
- ON-SITE AREA DRAIN LINE
- TIME OF CONCENTRATION FLOW PATH
- FLOW PATH LENGTH
- SOIL TYPE DELINEATION
- DRAINAGE BOUNDARY DESIGNATION AND AREA



Appendix 6

Proposed Condition Hydrology Calculations

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

Analysis prepared by:

Note: Area E1 consists of the proposed lagoons (5.5 acres), and will be self-contained, draining to sanitary sewer system. Therefore the total on-site area to be discharged is 9.9 acres (15.4 - 5.5)

***** DESCRIPTION OF STUDY *****
* Snug Harbor Surf Park *
* Proposed Condition Hydrology *
* 2-year storm event *

FILE NAME: PRSH2.DAT
TIME/DATE OF STUDY: 14:16 11/05/2024

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 2.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	WIDTH (FT)	LIP (FT)	HIKE (FT)	MANING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 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.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<< A-1
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 55.50 DOWNSTREAM(FEET) = 55.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 11.329
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.416
SUBAREA T_c AND LOSS RATE DATA(AMC I):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN	(MIN.)
COMMERCIAL	C	0.14	0.25	0.100	50	11.33

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.25$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$ A-1
 SUBAREA RUNOFF(CFS) = 0.18
 TOTAL AREA(ACRES) = 0.14 PEAK FLOW RATE(CFS) = 0.18

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) =	46.00	DOWNSTREAM(FEET) =	44.70
FLOW LENGTH(FEET) =	124.00	MANNING'S N =	0.013
DEPTH OF FLOW IN 6.0 INCH PIPE IS	2.3 INCHES		
PIPE-FLOW VELOCITY(FEET/SEC.) =	2.49		
ESTIMATED PIPE DIAMETER(INCH) =	6.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	0.18		
PIPE TRAVEL TIME(MIN.) =	0.83	$T_c(\text{MIN.}) =$	12.16
LONGEST FLOWPATH FROM NODE	10.00 TO NODE	12.00 =	454.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-2

=====

MAINLINE $T_c(\text{MIN.}) = 12.16$
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.359
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	C	0.28	0.25	0.100	50

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.25$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA AREA(ACRES) = 0.28 SUBAREA RUNOFF(CFS) = 0.34
 EFFECTIVE AREA(ACRES) = 0.42 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.02$
 AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.25$ AREA-AVERAGED $A_p = 0.10$
 TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 0.50

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) =	44.70	DOWNSTREAM(FEET) =	37.50
FLOW LENGTH(FEET) =	212.00	MANNING'S N =	0.013
DEPTH OF FLOW IN 6.0 INCH PIPE IS	3.1 INCHES		
PIPE-FLOW VELOCITY(FEET/SEC.) =	5.00		
ESTIMATED PIPE DIAMETER(INCH) =	6.00	NUMBER OF PIPES =	1
PIPE-FLOW(CFS) =	0.50		
PIPE TRAVEL TIME(MIN.) =	0.71	$T_c(\text{MIN.}) =$	12.87
LONGEST FLOWPATH FROM NODE	10.00 TO NODE	13.00 =	666.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-3

=====

MAINLINE $T_c(\text{MIN.}) = 12.87$
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.316

SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL C 0.59 0.25 0.100 50
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 0.69
 EFFECTIVE AREA(ACRES) = 1.01 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 1.17

A-3

 FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 37.50 DOWNSTREAM(FEET) = 28.50
 FLOW LENGTH(FEET) = 167.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 6.0 INCH PIPE IS 4.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.17
 ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.17
 PIPE TRAVEL TIME(MIN.) = 0.39 Tc(MIN.) = 13.25
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 14.00 = 833.00 FEET.

 FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-4

=====

MAINLINE Tc(MIN.) = 13.25
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.294
 SUBAREA LOSS RATE DATA(AMC I):
 DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
 COMMERCIAL C 0.66 0.25 0.100 50
 COMMERCIAL D 0.02 0.20 0.100 57
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.68 SUBAREA RUNOFF(CFS) = 0.78
 EFFECTIVE AREA(ACRES) = 1.69 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.7 PEAK FLOW RATE(CFS) = 1.93

 FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 28.50 DOWNSTREAM(FEET) = 25.80
 FLOW LENGTH(FEET) = 267.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 4.47
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.93
 PIPE TRAVEL TIME(MIN.) = 1.00 Tc(MIN.) = 14.25
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 15.00 = 1100.00 FEET.

 FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-5

```

=====
MAINLINE Tc(MIN.) = 14.25
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.241
SUBAREA LOSS RATE DATA(AMC I ):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
    LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL                C      0.02      0.25    0.100    50
COMMERCIAL                D      0.06      0.20    0.100    57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.21
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.08      SUBAREA RUNOFF(CFS) = 0.09
EFFECTIVE AREA(ACRES) = 1.77    AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.8        PEAK FLOW RATE(CFS) = 1.94

```

```

*****
FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 1

```

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

```

=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 14.25
RAINFALL INTENSITY(INCH/HR) = 1.24
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.25
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.77
TOTAL STREAM AREA(ACRES) = 1.77
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.94

```

```

*****
FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 21

```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

A-6

```

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 262.00
ELEVATION DATA: UPSTREAM(FEET) = 40.00 DOWNSTREAM(FEET) = 35.50

```

```

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.356
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.972
SUBAREA Tc AND LOSS RATE DATA(AMC I ):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS  Tc
    LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL                D      0.30      0.20    0.100    57   6.36
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 0.53
TOTAL AREA(ACRES) = 0.30    PEAK FLOW RATE(CFS) = 0.53

```

```

*****
FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-7

```

=====
MAINLINE Tc(MIN.) = 6.36
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.972
SUBAREA LOSS RATE DATA(AMC I ):

```

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.14	0.20	0.100	57
COMMERCIAL	C	0.14	0.25	0.100	50

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.28 SUBAREA RUNOFF(CFS) = 0.49
 EFFECTIVE AREA(ACRES) = 0.58 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 1.02

A-7

 FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-8

=====

MAINLINE Tc(MIN.) = 6.36
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.972
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.20	0.20	0.100	57

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.20 SUBAREA RUNOFF(CFS) = 0.35
 EFFECTIVE AREA(ACRES) = 0.78 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 0.8 PEAK FLOW RATE(CFS) = 1.37

 FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-9

=====

MAINLINE Tc(MIN.) = 6.36
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.972
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.26	0.20	0.100	57

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.26 SUBAREA RUNOFF(CFS) = 0.46
 EFFECTIVE AREA(ACRES) = 1.04 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 1.83

 FLOW PROCESS FROM NODE 17.00 TO NODE 15.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 25.80
 FLOW LENGTH(FEET) = 169.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 5.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.91
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.83
 PIPE TRAVEL TIME(MIN.) = 0.41 Tc(MIN.) = 6.76
 LONGEST FLOWPATH FROM NODE 16.00 TO NODE 15.00 = 431.00 FEET.

```

*****
FLOW PROCESS FROM NODE      15.00 TO NODE      15.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    6.76
RAINFALL INTENSITY(INCH/HR) =    1.90
AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.21
AREA-AVERAGED Ap =    0.10
EFFECTIVE STREAM AREA(ACRES) =          1.04
TOTAL STREAM AREA(ACRES) =          1.04
PEAK FLOW RATE(CFS) AT CONFLUENCE =          1.83

** CONFLUENCE DATA **
STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
NUMBER      (CFS) (MIN.) (INCH/HR) (INCH/HR)      (ACRES)  NODE
   1         1.94   14.25   1.241  0.25( 0.02)  0.10         1.8    10.00
   2         1.83    6.76   1.903  0.21( 0.02)  0.10         1.0    16.00

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

** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
NUMBER      (CFS) (MIN.) (INCH/HR) (INCH/HR)      (ACRES)  NODE
   1         3.25    6.76   1.903  0.23( 0.02)  0.10         1.9    16.00
   2         3.12   14.25   1.241  0.23( 0.02)  0.10         2.8    10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =          3.25   Tc(MIN.) =          6.76
EFFECTIVE AREA(ACRES) =          1.88   AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.23   AREA-AVERAGED Ap =    0.10
TOTAL AREA(ACRES) =          2.8
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      15.00 =    1100.00 FEET.

*****
FLOW PROCESS FROM NODE      15.00 TO NODE      18.00 IS CODE =  31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    25.80  DOWNSTREAM(FEET) =    11.50
FLOW LENGTH(FEET) =    82.00  MANNING'S N =    0.013
DEPTH OF FLOW IN  9.0 INCH PIPE IS  4.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    14.80
ESTIMATED PIPE DIAMETER(INCH) =    9.00   NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =          3.25
PIPE TRAVEL TIME(MIN.) =    0.09   Tc(MIN.) =    6.86
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      18.00 =    1182.00 FEET.

*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE =  31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    11.50  DOWNSTREAM(FEET) =    11.10
FLOW LENGTH(FEET) =    80.00  MANNING'S N =    0.013

```

DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.7 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 3.88
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.25
PIPE TRAVEL TIME(MIN.) = 0.34 Tc(MIN.) = 7.20
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 19.00 = 1262.00 FEET.

FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.20
RAINFALL INTENSITY(INCH/HR) = 1.84
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.88
TOTAL STREAM AREA(ACRES) = 2.81
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.25

FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

A-10

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(Feet) = 330.00
ELEVATION DATA: UPSTREAM(Feet) = 40.00 DOWNSTREAM(Feet) = 33.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.783

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.900

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	1.60	0.20	0.100	57	6.78
COMMERCIAL	C	0.20	0.25	0.100	50	6.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.21

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 3.05

TOTAL AREA(ACRES) = 1.80 PEAK FLOW RATE(CFS) = 3.05

FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(Feet) = 17.50 DOWNSTREAM(Feet) = 11.30
FLOW LENGTH(Feet) = 56.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 4.9 INCHES
PIPE-FLOW VELOCITY(Feet/Sec.) = 12.28
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.05
PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 6.86
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 22.00 = 386.00 FEET.

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 81

```

-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
A-11
=====
MAINLINE Tc(MIN.) = 6.86
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.888
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
LAND USE              GROUP   (ACRES)  (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"GRASS"                D        0.06      0.20      1.000    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.06      SUBAREA RUNOFF(CFS) = 0.09
EFFECTIVE AREA(ACRES) = 1.86    AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 1.9        PEAK FLOW RATE(CFS) = 3.12

*****
FLOW PROCESS FROM NODE 22.00 TO NODE 19.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 11.30 DOWNSTREAM(FEET) = 11.10
FLOW LENGTH(FEET) = 41.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.81
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.12
PIPE TRAVEL TIME(MIN.) = 0.18 Tc(MIN.) = 7.04
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 19.00 = 427.00 FEET.

*****
FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
A-12
=====
MAINLINE Tc(MIN.) = 7.04
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.860
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
LAND USE              GROUP   (ACRES)  (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"GRASS"                D        0.37      0.20      1.000    69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.37      SUBAREA RUNOFF(CFS) = 0.55
EFFECTIVE AREA(ACRES) = 2.23    AREA-AVERAGED Fm(INCH/HR) = 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 2.2        PEAK FLOW RATE(CFS) = 3.62

*****
FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 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.) = 7.04
RAINFALL INTENSITY(INCH/HR) = 1.86
AREA-AVERAGED Fm(INCH/HR) = 0.06

```

AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.27
EFFECTIVE STREAM AREA(ACRES) = 2.23
TOTAL STREAM AREA(ACRES) = 2.23
PEAK FLOW RATE(CFS) AT CONFLUENCE = 3.62

**** CONFLUENCE DATA ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.25	7.20	1.836	0.23(0.02)	0.10	1.9	16.00
1	3.12	14.69	1.219	0.23(0.02)	0.10	2.8	10.00
2	3.62	7.04	1.860	0.20(0.06)	0.27	2.2	20.00

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

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	6.84	7.04	1.860	0.21(0.04)	0.20	4.1	20.00
2	6.82	7.20	1.836	0.21(0.04)	0.19	4.1	16.00
3	5.46	14.69	1.219	0.21(0.04)	0.18	5.0	10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 6.84 Tc(MIN.) = 7.04
EFFECTIVE AREA(ACRES) = 4.07 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.20
TOTAL AREA(ACRES) = 5.0
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 19.00 = 1262.00 FEET.

Area A

FLOW PROCESS FROM NODE 19.00 TO NODE 23.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 11.10 DOWNSTREAM(FEET) = 11.00

FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 4.24

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 6.84

PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 7.14

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 23.00 = 1288.00 FEET.

FLOW PROCESS FROM NODE 30.00 TO NODE 31.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

B-1

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00

ELEVATION DATA: UPSTREAM(FEET) = 39.90 DOWNSTREAM(FEET) = 38.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.862

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.533

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	C	0.11	0.25	0.100	50	9.86

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
SUBAREA RUNOFF(CFS) = 0.15
TOTAL AREA(ACRES) = 0.11 PEAK FLOW RATE(CFS) = 0.15

B-1

```
*****
FLOW PROCESS FROM NODE      31.00 TO NODE      32.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.40 DOWNSTREAM(FEET) = 34.90
FLOW LENGTH(FEET) = 303.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 6.0 INCH PIPE IS 2.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 1.79
ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.15
PIPE TRAVEL TIME(MIN.) = 2.82 Tc(MIN.) = 12.68
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 32.00 = 633.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      32.00 TO NODE      32.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 12.68
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.327
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/  SCS SOIL  AREA      Fp      Ap      SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL         C      0.22    0.25    0.100    50
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.22 SUBAREA RUNOFF(CFS) = 0.26
EFFECTIVE AREA(ACRES) = 0.33 AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 0.39
```

B-2

```
*****
FLOW PROCESS FROM NODE      32.00 TO NODE      33.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.90 DOWNSTREAM(FEET) = 34.20
FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 3.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.34
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.39
PIPE TRAVEL TIME(MIN.) = 0.95 Tc(MIN.) = 13.63
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 33.00 = 766.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      33.00 TO NODE      33.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 13.63
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.273
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/  SCS SOIL  AREA      Fp      Ap      SCS
LAND USE          GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
```

B-3

```

COMMERCIAL          C          0.14      0.25      0.100      50
COMMERCIAL          D          0.30      0.20      0.100      57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.44      SUBAREA RUNOFF(CFS) = 0.50
EFFECTIVE AREA(ACRES) = 0.77      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.8      PEAK FLOW RATE(CFS) = 0.87

```

B-3

```

*****
FLOW PROCESS FROM NODE      33.00 TO NODE      33.00 IS CODE = 81
-----

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

B-4

```

=====
MAINLINE Tc(MIN.) = 13.63
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.273
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL            C      0.08      0.25      0.100      50
COMMERCIAL            D      0.16      0.20      0.100      57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.24      SUBAREA RUNOFF(CFS) = 0.27
EFFECTIVE AREA(ACRES) = 1.01      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.0      PEAK FLOW RATE(CFS) = 1.14

```

```

*****
FLOW PROCESS FROM NODE      33.00 TO NODE      34.00 IS CODE = 31
-----

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 34.20      DOWNSTREAM(FEET) = 33.00
FLOW LENGTH(FEET) = 237.00      MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 5.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.02
ESTIMATED PIPE DIAMETER(INCH) = 12.00      NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.14
PIPE TRAVEL TIME(MIN.) = 1.31      Tc(MIN.) = 14.94
LONGEST FLOWPATH FROM NODE      30.00 TO NODE      34.00 = 1003.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      34.00 TO NODE      34.00 IS CODE = 81
-----

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

B-5

```

=====
MAINLINE Tc(MIN.) = 14.94
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.208
SUBAREA LOSS RATE DATA(AMC I ):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS
LAND USE              GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL            D      0.23      0.20      0.100      57
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.23      SUBAREA RUNOFF(CFS) = 0.25
EFFECTIVE AREA(ACRES) = 1.24      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.22      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.2      PEAK FLOW RATE(CFS) = 1.32

```

Area B

```

*****

```

Area B

FLOW PROCESS FROM NODE 34.00 TO NODE 35.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 33.00 DOWNSTREAM(FEET) = 18.40
 FLOW LENGTH(FEET) = 335.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 4.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.02
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.32
 PIPE TRAVEL TIME(MIN.) = 0.80 Tc(MIN.) = 15.73
 LONGEST FLOWPATH FROM NODE 30.00 TO NODE 35.00 = 1338.00 FEET.

FLOW PROCESS FROM NODE 50.00 TO NODE 51.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

C-1

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
 ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 32.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.268

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.197

SUBAREA Tc AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.63	0.20	0.100	57	5.27

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 1.23

TOTAL AREA(ACRES) = 0.63 PEAK FLOW RATE(CFS) = 1.23

FLOW PROCESS FROM NODE 51.00 TO NODE 51.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

C-2

=====

MAINLINE Tc(MIN.) = 5.27

* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.197

SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.87	0.20	0.100	57

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 1.70

EFFECTIVE AREA(ACRES) = 1.50 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 2.94

FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

C-3

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 32.00 DOWNSTREAM(FEET) = 27.00
 CHANNEL LENGTH THRU SUBAREA(FEET) = 247.00 CHANNEL SLOPE = 0.0202
 CHANNEL BASE(FEET) = 2.00 "Z" FACTOR = 20.000

C-3

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.960
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	1.65	0.20	0.100	57

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 4.38
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/Sec.) = 3.56
 AVERAGE FLOW DEPTH(Feet) = 0.20 TRAVEL TIME(MIN.) = 1.16
 Tc(MIN.) = 6.43
 SUBAREA AREA(ACRES) = 1.65 SUBAREA RUNOFF(CFS) = 2.88
 EFFECTIVE AREA(ACRES) = 3.15 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 5.50
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(Feet) = 0.23 FLOW VELOCITY(Feet/Sec.) = 3.73
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 577.00 FEET.

FLOW PROCESS FROM NODE 52.00 TO NODE 53.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(Feet) = 23.00 DOWNSTREAM(Feet) = 21.80
 FLOW LENGTH(Feet) = 121.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 11.1 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 5.63
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 5.50
 PIPE TRAVEL TIME(MIN.) = 0.36 Tc(MIN.) = 6.78
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 53.00 = 698.00 FEET.

FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(Feet) = 21.80 DOWNSTREAM(Feet) = 20.00
 FLOW LENGTH(Feet) = 102.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.0 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 7.12
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 5.50
 PIPE TRAVEL TIME(MIN.) = 0.24 Tc(MIN.) = 7.02
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 54.00 = 800.00 FEET.

FLOW PROCESS FROM NODE 54.00 TO NODE 54.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

C-4

=====

MAINLINE Tc(MIN.) = 7.02
 * 2 YEAR RAINFALL INTENSITY(INCH/HR) = 1.863
 SUBAREA LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.29	0.20	0.100	57

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
SUBAREA AREA(ACRES) = 0.29 SUBAREA RUNOFF(CFS) = 0.48
EFFECTIVE AREA(ACRES) = 3.44 AREA-AVERAGED F_m (INCH/HR) = 0.02
AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED A_p = 0.10
TOTAL AREA(ACRES) = 3.4 PEAK FLOW RATE(CFS) = 5.70

C-4

```
*****
FLOW PROCESS FROM NODE    54.00 TO NODE    55.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    20.00 DOWNSTREAM(FEET) =    16.70
FLOW LENGTH(FEET) =    36.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS    6.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.37
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) =    5.70
PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) =    7.07
LONGEST FLOWPATH FROM NODE    50.00 TO NODE    55.00 =    836.00 FEET.
```

Area C

```
*****
FLOW PROCESS FROM NODE    54.00 TO NODE    55.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    20.00 DOWNSTREAM(FEET) =    16.70
FLOW LENGTH(FEET) =    45.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS    6.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.29
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) =    5.70
PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) =    7.13
LONGEST FLOWPATH FROM NODE    50.00 TO NODE    55.00 =    881.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE    60.00 TO NODE    61.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) =    145.00
ELEVATION DATA: UPSTREAM(FEET) =    31.50 DOWNSTREAM(FEET) =    15.00
```

D-1

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.461
* 2 YEAR RAINFALL INTENSITY(INCH/HR) = 2.152
SUBAREA T_c AND LOSS RATE DATA(AMC I):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	D	0.19	0.20	0.850	57	5.46

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.850
SUBAREA RUNOFF(CFS) = 0.34
TOTAL AREA(ACRES) = 0.19 PEAK FLOW RATE(CFS) = 0.34

```
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) =    0.2 TC(MIN.) =    5.46
EFFECTIVE AREA(ACRES) =    0.19 AREA-AVERAGED Fm(INCH/HR)= 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.850
```

Area D

PEAK FLOW RATE(CFS) = 0.34

Area D

=====

END OF RATIONAL METHOD ANALYSIS

=====



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

Analysis prepared by:

Note: Area E1 consists of the proposed lagoons (5.53 acres), and will be self-contained, draining to sanitary sewer system. Therefore the total on-site area to be discharged is 9.90 acres (15.43 - 5.53)

***** DESCRIPTION OF STUDY *****
* Snug Harbor Surf Park *
* Proposed Condition Hydrology *
* 25-year storm event *

FILE NAME: PRSH25.DAT
TIME/DATE OF STUDY: 13:56 11/05/2024

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 25.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	LIP (FT)	HIKE (FT)	MANING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 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.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<< A-1
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 55.50 DOWNSTREAM(FEET) = 55.00

$T_c = K * [(LENGTH^{**} 3.00) / (ELEVATION CHANGE)]^{**} 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 11.329
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.036
SUBAREA T_c AND LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS T_c

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN	(MIN.)
COMMERCIAL	C	0.14	0.25	0.100	69	11.33
SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.25						
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100						
SUBAREA RUNOFF(CFS) = 0.38						
TOTAL AREA(ACRES) = 0.14 PEAK FLOW RATE(CFS) = 0.38						

A-1

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 46.00 DOWNSTREAM(FEET) = 44.70
 FLOW LENGTH(FEET) = 124.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 6.0 INCH PIPE IS 3.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 2.99
 ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 0.38
 PIPE TRAVEL TIME(MIN.) = 0.69 T_c (MIN.) = 12.02
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 454.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-2

MAINLINE T_c (MIN.) = 12.02

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.936

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	C	0.28	0.25	0.100	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.25

SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100

SUBAREA AREA(ACRES) = 0.28 SUBAREA RUNOFF(CFS) = 0.73

EFFECTIVE AREA(ACRES) = 0.42 AREA-AVERAGED F_m (INCH/HR) = 0.02

AREA-AVERAGED F_p (INCH/HR) = 0.25 AREA-AVERAGED A_p = 0.10

TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 1.10

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 44.70 DOWNSTREAM(FEET) = 37.50
 FLOW LENGTH(FEET) = 212.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 3.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 6.12
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.10
 PIPE TRAVEL TIME(MIN.) = 0.58 T_c (MIN.) = 12.60
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 13.00 = 666.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-3

MAINLINE T_c (MIN.) = 12.60

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.859

A-3

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	C	0.59	0.25	0.100	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 1.50
 EFFECTIVE AREA(ACRES) = 1.01 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 2.58

FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 37.50 DOWNSTREAM(FEET) = 28.50
 FLOW LENGTH(FEET) = 167.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 5.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.95
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.58
 PIPE TRAVEL TIME(MIN.) = 0.31 Tc(MIN.) = 12.91
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 14.00 = 833.00 FEET.

FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-4

=====

MAINLINE Tc(MIN.) = 12.91
 * 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.820
 SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	C	0.66	0.25	0.100	69
COMMERCIAL	D	0.02	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.68 SUBAREA RUNOFF(CFS) = 1.71
 EFFECTIVE AREA(ACRES) = 1.69 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.7 PEAK FLOW RATE(CFS) = 4.25

FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 28.50 DOWNSTREAM(FEET) = 25.80
 FLOW LENGTH(FEET) = 267.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.42
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 4.25
 PIPE TRAVEL TIME(MIN.) = 0.82 Tc(MIN.) = 13.73
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 15.00 = 1100.00 FEET.

FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 81

----->>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<-----

A-5

```
=====
MAINLINE Tc(MIN.) = 13.73
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.723
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS
    LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL                C       0.02    0.25    0.100    69
COMMERCIAL                D       0.06    0.20    0.100    75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.21
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.08      SUBAREA RUNOFF(CFS) = 0.19
EFFECTIVE AREA(ACRES) = 1.77    AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.8        PEAK FLOW RATE(CFS) = 4.30
=====
```

```
*****
FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 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.) = 13.73
RAINFALL INTENSITY(INCH/HR) = 2.72
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.25
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.77
TOTAL STREAM AREA(ACRES) = 1.77
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.30
=====
```

```
*****
FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 21
=====
```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<-----

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<-----

A-6

```
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 262.00
ELEVATION DATA: UPSTREAM(FEET) = 40.00 DOWNSTREAM(FEET) = 35.50
=====
```

```
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.356
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.211
SUBAREA Tc AND LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS  Tc
    LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL                D       0.30    0.20    0.100    75   6.36
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 1.13
TOTAL AREA(ACRES) = 0.30    PEAK FLOW RATE(CFS) = 1.13
=====
```

```
*****
FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81
=====
```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<-----

A-7

```
=====
MAINLINE Tc(MIN.) = 6.36
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.211
SUBAREA LOSS RATE DATA(AMC II):
=====
```

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL D 0.14 0.20 0.100 75
COMMERCIAL C 0.14 0.25 0.100 69
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.28 SUBAREA RUNOFF(CFS) = 1.06
EFFECTIVE AREA(ACRES) = 0.58 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 2.19

A-7

FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-8

=====

MAINLINE Tc(MIN.) = 6.36
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.211
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL D 0.20 0.20 0.100 75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.20 SUBAREA RUNOFF(CFS) = 0.75
EFFECTIVE AREA(ACRES) = 0.78 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.8 PEAK FLOW RATE(CFS) = 2.94

FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-9

=====

MAINLINE Tc(MIN.) = 6.36
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.211
SUBAREA LOSS RATE DATA(AMC II):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL D 0.26 0.20 0.100 75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.26 SUBAREA RUNOFF(CFS) = 0.98
EFFECTIVE AREA(ACRES) = 1.04 AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 3.92

FLOW PROCESS FROM NODE 17.00 TO NODE 15.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 25.80
FLOW LENGTH(FEET) = 169.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.36
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.92
PIPE TRAVEL TIME(MIN.) = 0.34 Tc(MIN.) = 6.69
LONGEST FLOWPATH FROM NODE 16.00 TO NODE 15.00 = 431.00 FEET.

```

*****
FLOW PROCESS FROM NODE      15.00 TO NODE      15.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    6.69
RAINFALL INTENSITY(INCH/HR) =    4.09
AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.21
AREA-AVERAGED Ap =    0.10
EFFECTIVE STREAM AREA(ACRES) =          1.04
TOTAL STREAM AREA(ACRES) =          1.04
PEAK FLOW RATE(CFS) AT CONFLUENCE =          3.92

** CONFLUENCE DATA **
STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
NUMBER      (CFS) (MIN.) (INCH/HR) (INCH/HR)      (ACRES)  NODE
   1         4.30  13.73   2.723  0.25( 0.02)  0.10         1.8      10.00
   2         3.92   6.69   4.090  0.21( 0.02)  0.10         1.0      16.00

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

** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
NUMBER      (CFS) (MIN.) (INCH/HR) (INCH/HR)      (ACRES)  NODE
   1         7.08   6.69   4.090  0.23( 0.02)  0.10         1.9      16.00
   2         6.90  13.73   2.723  0.23( 0.02)  0.10         2.8      10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =          7.08      Tc(MIN.) =          6.69
EFFECTIVE AREA(ACRES) =          1.90      AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.23      AREA-AVERAGED Ap =    0.10
TOTAL AREA(ACRES) =          2.8
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      15.00 =    1100.00 FEET.

*****
FLOW PROCESS FROM NODE      15.00 TO NODE      18.00 IS CODE =  31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    25.80  DOWNSTREAM(FEET) =    11.50
FLOW LENGTH(FEET) =    82.00  MANNING'S N =    0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS    6.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    17.99
ESTIMATED PIPE DIAMETER(INCH) =    12.00      NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =          7.08
PIPE TRAVEL TIME(MIN.) =    0.08      Tc(MIN.) =    6.77
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      18.00 =    1182.00 FEET.

*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE =  31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    11.50  DOWNSTREAM(FEET) =    11.10
FLOW LENGTH(FEET) =    80.00  MANNING'S N =    0.013

```

DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.73
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.08
PIPE TRAVEL TIME(MIN.) = 0.28 Tc(MIN.) = 7.05
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 19.00 = 1262.00 FEET.

FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.05
RAINFALL INTENSITY(INCH/HR) = 3.97
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.90
TOTAL STREAM AREA(ACRES) = 2.81
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.08

FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

A-10

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 40.00 DOWNSTREAM(FEET) = 33.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.783

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.059

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	1.60	0.20	0.100	75	6.78
COMMERCIAL	C	0.20	0.25	0.100	69	6.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.21

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 6.54

TOTAL AREA(ACRES) = 1.80 PEAK FLOW RATE(CFS) = 6.54

FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 17.50 DOWNSTREAM(FEET) = 11.30
FLOW LENGTH(FEET) = 56.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 6.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.86
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 6.54
PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 6.85
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 22.00 = 386.00 FEET.

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 81

```

-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-11
=====
MAINLINE Tc(MIN.) = 6.85
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.038
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
    LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"GRASS"                  D        0.06      0.20      1.000    84
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.06      SUBAREA RUNOFF(CFS) = 0.21
EFFECTIVE AREA(ACRES) = 1.86    AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 1.9        PEAK FLOW RATE(CFS) = 6.72

*****
FLOW PROCESS FROM NODE 22.00 TO NODE 19.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 11.30 DOWNSTREAM(FEET) = 11.10
FLOW LENGTH(FEET) = 41.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 18.0 INCH PIPE IS 14.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.49
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 6.72
PIPE TRAVEL TIME(MIN.) = 0.15 Tc(MIN.) = 7.00
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 19.00 = 427.00 FEET.

*****
FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<< A-12
=====
MAINLINE Tc(MIN.) = 7.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.988
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp      Ap      SCS
    LAND USE            GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"GRASS"                  D        0.37      0.20      1.000    84
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.37      SUBAREA RUNOFF(CFS) = 1.26
EFFECTIVE AREA(ACRES) = 2.23    AREA-AVERAGED Fm(INCH/HR) = 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 2.2        PEAK FLOW RATE(CFS) = 7.89

*****
FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 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.) = 7.00
RAINFALL INTENSITY(INCH/HR) = 3.99
AREA-AVERAGED Fm(INCH/HR) = 0.06

```

AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.27
EFFECTIVE STREAM AREA(ACRES) = 2.23
TOTAL STREAM AREA(ACRES) = 2.23
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.89

**** CONFLUENCE DATA ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	7.08	7.05	3.971	0.23(0.02)	0.10	1.9	16.00
1	6.90	14.10	2.683	0.23(0.02)	0.10	2.8	10.00
2	7.89	7.00	3.988	0.20(0.06)	0.27	2.2	20.00

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

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	14.95	7.00	3.988	0.21(0.04)	0.19	4.1	20.00
2	14.94	7.05	3.971	0.21(0.04)	0.19	4.1	16.00
3	12.18	14.10	2.683	0.21(0.04)	0.18	5.0	10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 14.95 Tc(MIN.) = 7.00
EFFECTIVE AREA(ACRES) = 4.12 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.19
TOTAL AREA(ACRES) = 5.0
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 19.00 = 1262.00 FEET.

Area A

FLOW PROCESS FROM NODE 19.00 TO NODE 23.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 11.10 DOWNSTREAM(FEET) = 11.00

FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 27.0 INCH PIPE IS 18.6 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 5.11

ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 14.95

PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 7.08

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 23.00 = 1288.00 FEET.

FLOW PROCESS FROM NODE 30.00 TO NODE 31.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

B-1

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00

ELEVATION DATA: UPSTREAM(FEET) = 39.90 DOWNSTREAM(FEET) = 38.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.862

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.284

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	C	0.11	0.25	0.100	69	9.86

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25

B-1

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
SUBAREA RUNOFF(CFS) = 0.32
TOTAL AREA(ACRES) = 0.11 PEAK FLOW RATE(CFS) = 0.32

FLOW PROCESS FROM NODE 31.00 TO NODE 32.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 36.40 DOWNSTREAM(FEET) = 34.90
FLOW LENGTH(FEET) = 303.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 6.0 INCH PIPE IS 4.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.15
ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.32
PIPE TRAVEL TIME(MIN.) = 2.35 T_c (MIN.) = 12.22
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 32.00 = 633.00 FEET.

FLOW PROCESS FROM NODE 32.00 TO NODE 32.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

B-2

=====

MAINLINE T_c (MIN.) = 12.22
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.909
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	C	0.22	0.25	0.100	69

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
SUBAREA AREA(ACRES) = 0.22 SUBAREA RUNOFF(CFS) = 0.57
EFFECTIVE AREA(ACRES) = 0.33 AREA-AVERAGED F_m (INCH/HR) = 0.03
AREA-AVERAGED F_p (INCH/HR) = 0.25 AREA-AVERAGED $A_p = 0.10$
TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 0.86

FLOW PROCESS FROM NODE 32.00 TO NODE 33.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 34.90 DOWNSTREAM(FEET) = 34.20
FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 5.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.82
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.86
PIPE TRAVEL TIME(MIN.) = 0.79 T_c (MIN.) = 13.00
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 33.00 = 766.00 FEET.

FLOW PROCESS FROM NODE 33.00 TO NODE 33.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

B-3

=====

MAINLINE T_c (MIN.) = 13.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.808
SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
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COMMERCIAL          C          0.14      0.25      0.100      69
COMMERCIAL          D          0.30      0.20      0.100      75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.44      SUBAREA RUNOFF(CFS) = 1.10
EFFECTIVE AREA(ACRES) = 0.77      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.8      PEAK FLOW RATE(CFS) = 1.93

```

```

FLOW PROCESS FROM NODE      33.00 TO NODE      33.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<      B-4

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=====
MAINLINE Tc(MIN.) = 13.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.808
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL      AREA      Fp      Ap      SCS
    LAND USE      GROUP      (ACRES)      (INCH/HR)      (DECIMAL)      CN
COMMERCIAL          C          0.08      0.25      0.100      69
COMMERCIAL          D          0.16      0.20      0.100      75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.24      SUBAREA RUNOFF(CFS) = 0.60
EFFECTIVE AREA(ACRES) = 1.01      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.0      PEAK FLOW RATE(CFS) = 2.53

```

```

FLOW PROCESS FROM NODE      33.00 TO NODE      34.00 IS CODE = 31

```

```

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

```

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 34.20      DOWNSTREAM(FEET) = 33.00
FLOW LENGTH(FEET) = 237.00      MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 8.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.69
ESTIMATED PIPE DIAMETER(INCH) = 15.00      NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.53
PIPE TRAVEL TIME(MIN.) = 1.07      Tc(MIN.) = 14.07
LONGEST FLOWPATH FROM NODE      30.00 TO NODE      34.00 = 1003.00 FEET.

```

```

FLOW PROCESS FROM NODE      34.00 TO NODE      34.00 IS CODE = 81

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```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<      B-5

```

```

=====
MAINLINE Tc(MIN.) = 14.07
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 2.685
SUBAREA LOSS RATE DATA(AMC II):
  DEVELOPMENT TYPE/      SCS SOIL      AREA      Fp      Ap      SCS
    LAND USE      GROUP      (ACRES)      (INCH/HR)      (DECIMAL)      CN
COMMERCIAL          D          0.23      0.20      0.100      75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.23      SUBAREA RUNOFF(CFS) = 0.55
EFFECTIVE AREA(ACRES) = 1.24      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.22      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.2      PEAK FLOW RATE(CFS) = 2.97

```

Area B

Area B

FLOW PROCESS FROM NODE 34.00 TO NODE 35.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 33.00 DOWNSTREAM(FEET) = 18.40
FLOW LENGTH(FEET) = 335.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 6.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.40
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.97
PIPE TRAVEL TIME(MIN.) = 0.66 Tc(MIN.) = 14.74
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 35.00 = 1338.00 FEET.

FLOW PROCESS FROM NODE 50.00 TO NODE 51.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

C-1

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 55.00 DOWNSTREAM(FEET) = 32.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.268

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.683

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	0.63	0.20	0.100	75	5.27

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 2.64

TOTAL AREA(ACRES) = 0.63 PEAK FLOW RATE(CFS) = 2.64

FLOW PROCESS FROM NODE 51.00 TO NODE 51.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

C-2

MAINLINE Tc(MIN.) = 5.27

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.683

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.87	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA AREA(ACRES) = 0.87 SUBAREA RUNOFF(CFS) = 3.65

EFFECTIVE AREA(ACRES) = 1.50 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 1.5 PEAK FLOW RATE(CFS) = 6.30

FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 51

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<

C-3

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

ELEVATION DATA: UPSTREAM(FEET) = 32.00 DOWNSTREAM(FEET) = 27.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 247.00 CHANNEL SLOPE = 0.0202
CHANNEL BASE(FEET) = 2.00 "Z" FACTOR = 20.000

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(FEET) = 10.00
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.256

C-3

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	1.65	0.20	0.100	75

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.44

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 4.25

AVERAGE FLOW DEPTH(FEET) = 0.29 TRAVEL TIME(MIN.) = 0.97

Tc(MIN.) = 6.24

SUBAREA AREA(ACRES) = 1.65 SUBAREA RUNOFF(CFS) = 6.29

EFFECTIVE AREA(ACRES) = 3.15 AREA-AVERAGED Fm(INCH/HR) = 0.02

AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10

TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 12.01

END OF SUBAREA CHANNEL FLOW HYDRAULICS:

DEPTH(FEET) = 0.32 FLOW VELOCITY(FEET/SEC.) = 4.53

LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 577.00 FEET.

FLOW PROCESS FROM NODE 52.00 TO NODE 53.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 23.00 DOWNSTREAM(FEET) = 21.80

FLOW LENGTH(FEET) = 121.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.2 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 6.92

ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 12.01

PIPE TRAVEL TIME(MIN.) = 0.29 Tc(MIN.) = 6.53

LONGEST FLOWPATH FROM NODE 50.00 TO NODE 53.00 = 698.00 FEET.

FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 21.80 DOWNSTREAM(FEET) = 20.00

FLOW LENGTH(FEET) = 102.00 MANNING'S N = 0.013

DEPTH OF FLOW IN 18.0 INCH PIPE IS 13.4 INCHES

PIPE-FLOW VELOCITY(FEET/SEC.) = 8.48

ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1

PIPE-FLOW(CFS) = 12.01

PIPE TRAVEL TIME(MIN.) = 0.20 Tc(MIN.) = 6.73

LONGEST FLOWPATH FROM NODE 50.00 TO NODE 54.00 = 800.00 FEET.

FLOW PROCESS FROM NODE 54.00 TO NODE 54.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

C-4

MAINLINE Tc(MIN.) = 6.73

* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.077

SUBAREA LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.29	0.20	0.100	75

C-4

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
SUBAREA AREA(ACRES) = 0.29 SUBAREA RUNOFF(CFS) = 1.06
EFFECTIVE AREA(ACRES) = 3.44 AREA-AVERAGED F_m (INCH/HR) = 0.02
AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED A_p = 0.10
TOTAL AREA(ACRES) = 3.4 PEAK FLOW RATE(CFS) = 12.56

```
*****
FLOW PROCESS FROM NODE      54.00 TO NODE      55.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 20.00 DOWNSTREAM(FEET) = 16.70
FLOW LENGTH(FEET) = 36.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.24
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.56
PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 6.77
LONGEST FLOWPATH FROM NODE 50.00 TO NODE 55.00 = 836.00 FEET.
```

Area C

```
*****
FLOW PROCESS FROM NODE      54.00 TO NODE      55.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 20.00 DOWNSTREAM(FEET) = 16.70
FLOW LENGTH(FEET) = 45.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.87
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 12.56
PIPE TRAVEL TIME(MIN.) = 0.05 Tc(MIN.) = 6.82
LONGEST FLOWPATH FROM NODE 50.00 TO NODE 55.00 = 881.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      60.00 TO NODE      61.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 145.00
ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 15.00
```

D-1

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 5.461
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 4.589
SUBAREA T_c AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN	T_c (MIN.)
PUBLIC PARK	D	0.19	0.20	0.850	75	5.46

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.850
SUBAREA RUNOFF(CFS) = 0.76
TOTAL AREA(ACRES) = 0.19 PEAK FLOW RATE(CFS) = 0.76

```
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 5.46
EFFECTIVE AREA(ACRES) = 0.19 AREA-AVERAGED Fm(INCH/HR)= 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.850
```

Area D

PEAK FLOW RATE(CFS) = 0.76

Area D

=====

END OF RATIONAL METHOD ANALYSIS

=====



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

Analysis prepared by:

Note: Area E1 consists of the proposed lagoons (5.53 acres), and will be self-contained, draining to sanitary sewer system. Therefore the total on-site area to be discharged is 9.90 acres (15.43 - 5.53)

***** DESCRIPTION OF STUDY *****
* Snug Harbor Surf Park *
* Proposed Condition Hydrology *
* 100-storm event *

FILE NAME: PRSH100.DAT
TIME/DATE OF STUDY: 14:35 11/05/2024

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
DATA BANK RAINFALL USED
ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB GUTTER-GEOMETRIES: HEIGHT (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 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.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<< A-1
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 55.50 DOWNSTREAM(FEET) = 55.00

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM T_c (MIN.) = 11.329
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.872
SUBAREA T_c AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/	SCS SOIL	AREA	Fp	Ap	SCS	Tc
-------------------	----------	------	----	----	-----	----

LAND USE	GROUP	(ACRES)	(INCH/HR)	(DECIMAL)	CN	(MIN.)
COMMERCIAL	C	0.14	0.25	0.100	86	11.33

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.25$
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
 SUBAREA RUNOFF(CFS) = 0.48
 TOTAL AREA(ACRES) = 0.14 PEAK FLOW RATE(CFS) = 0.48

A-1

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 46.00 DOWNSTREAM(FEET) = 44.70
 FLOW LENGTH(FEET) = 124.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 6.0 INCH PIPE IS 4.4 INCHES
 PIPE-FLOW VELOCITY(FT/SEC.) = 3.15
 ESTIMATED PIPE DIAMETER(INCH) = 6.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 0.48
 PIPE TRAVEL TIME(MIN.) = 0.66 $T_c(\text{MIN.}) = 11.99$
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 454.00 FEET.

FLOW PROCESS FROM NODE 12.00 TO NODE 12.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-2

MAINLINE $T_c(\text{MIN.}) = 11.99$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.749

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	F_p (INCH/HR)	A_p (DECIMAL)	SCS CN
COMMERCIAL	C	0.28	0.25	0.100	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, $F_p(\text{INCH/HR}) = 0.25$

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$

SUBAREA AREA(ACRES) = 0.28 SUBAREA RUNOFF(CFS) = 0.94

EFFECTIVE AREA(ACRES) = 0.42 AREA-AVERAGED $F_m(\text{INCH/HR}) = 0.02$

AREA-AVERAGED $F_p(\text{INCH/HR}) = 0.25$ AREA-AVERAGED $A_p = 0.10$

TOTAL AREA(ACRES) = 0.4 PEAK FLOW RATE(CFS) = 1.41

FLOW PROCESS FROM NODE 12.00 TO NODE 13.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 44.70 DOWNSTREAM(FEET) = 37.50
 FLOW LENGTH(FEET) = 212.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 4.4 INCHES
 PIPE-FLOW VELOCITY(FT/SEC.) = 6.49
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 1.41
 PIPE TRAVEL TIME(MIN.) = 0.54 $T_c(\text{MIN.}) = 12.53$
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 13.00 = 666.00 FEET.

FLOW PROCESS FROM NODE 13.00 TO NODE 13.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-3

MAINLINE $T_c(\text{MIN.}) = 12.53$

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.655

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	C	0.59	0.25	0.100	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.59 SUBAREA RUNOFF(CFS) = 1.93
 EFFECTIVE AREA(ACRES) = 1.01 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 3.30

A-3

FLOW PROCESS FROM NODE 13.00 TO NODE 14.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 37.50 DOWNSTREAM(FEET) = 28.50
 FLOW LENGTH(FEET) = 167.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 9.0 INCH PIPE IS 6.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 9.35
 ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.30
 PIPE TRAVEL TIME(MIN.) = 0.30 Tc(MIN.) = 12.83
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 14.00 = 833.00 FEET.

FLOW PROCESS FROM NODE 14.00 TO NODE 14.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-4

MAINLINE Tc(MIN.) = 12.83

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.606

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	C	0.66	0.25	0.100	86
COMMERCIAL	D	0.02	0.20	0.100	91

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.68 SUBAREA RUNOFF(CFS) = 2.19
 EFFECTIVE AREA(ACRES) = 1.69 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.7 PEAK FLOW RATE(CFS) = 5.45

FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 28.50 DOWNSTREAM(FEET) = 25.80
 FLOW LENGTH(FEET) = 267.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 11.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 5.67
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 5.45
 PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 13.61
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 15.00 = 1100.00 FEET.

FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 IS CODE = 81

----->>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<-----

A-5

```
=====
MAINLINE Tc(MIN.) = 13.61
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.486
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap        SCS
    LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL                C       0.02    0.25    0.100    86
COMMERCIAL                D       0.06    0.20    0.100    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.21
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.08      SUBAREA RUNOFF(CFS) = 0.25
EFFECTIVE AREA(ACRES) = 1.77    AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.8        PEAK FLOW RATE(CFS) = 5.51
=====
```

```
*****
FLOW PROCESS FROM NODE 15.00 TO NODE 15.00 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.) = 13.61
RAINFALL INTENSITY(INCH/HR) = 3.49
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.25
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.77
TOTAL STREAM AREA(ACRES) = 1.77
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.51
=====
```

```
*****
FLOW PROCESS FROM NODE 16.00 TO NODE 17.00 IS CODE = 21
=====
```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

A-6

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

```
=====
INITIAL SUBAREA FLOW-LENGTH(Feet) = 262.00
ELEVATION DATA: UPSTREAM(Feet) = 40.00 DOWNSTREAM(Feet) = 35.50
=====
```

```
Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.356
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.392
SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap        SCS   Tc
    LAND USE              GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL                D       0.30    0.20    0.100    91    6.36
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 1.45
TOTAL AREA(ACRES) = 0.30    PEAK FLOW RATE(CFS) = 1.45
=====
```

```
*****
FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81
=====
```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-7

```
=====
MAINLINE Tc(MIN.) = 6.36
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.392
SUBAREA LOSS RATE DATA(AMC III):
=====
```

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.14	0.20	0.100	91
COMMERCIAL	C	0.14	0.25	0.100	86

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.28 SUBAREA RUNOFF(CFS) = 1.35
 EFFECTIVE AREA(ACRES) = 0.58 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 0.6 PEAK FLOW RATE(CFS) = 2.80

A-7

 FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-8

MAINLINE Tc(MIN.) = 6.36
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.392
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.20	0.20	0.100	91

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.20 SUBAREA RUNOFF(CFS) = 0.97
 EFFECTIVE AREA(ACRES) = 0.78 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 0.8 PEAK FLOW RATE(CFS) = 3.77

 FLOW PROCESS FROM NODE 17.00 TO NODE 17.00 IS CODE = 81

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

A-9

MAINLINE Tc(MIN.) = 6.36
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.392
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.26	0.20	0.100	91

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA AREA(ACRES) = 0.26 SUBAREA RUNOFF(CFS) = 1.26
 EFFECTIVE AREA(ACRES) = 1.04 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 1.0 PEAK FLOW RATE(CFS) = 5.03

 FLOW PROCESS FROM NODE 17.00 TO NODE 15.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

 ELEVATION DATA: UPSTREAM(FEET) = 31.50 DOWNSTREAM(FEET) = 25.80
 FLOW LENGTH(FEET) = 169.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 8.79
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 5.03
 PIPE TRAVEL TIME(MIN.) = 0.32 Tc(MIN.) = 6.68
 LONGEST FLOWPATH FROM NODE 16.00 TO NODE 15.00 = 431.00 FEET.

```

*****
FLOW PROCESS FROM NODE      15.00 TO NODE      15.00 IS CODE =   1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =    6.68
RAINFALL INTENSITY(INCH/HR) =    5.24
AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.21
AREA-AVERAGED Ap =    0.10
EFFECTIVE STREAM AREA(ACRES) =          1.04
TOTAL STREAM AREA(ACRES) =          1.04
PEAK FLOW RATE(CFS) AT CONFLUENCE =          5.03

** CONFLUENCE DATA **
STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
NUMBER      (CFS) (MIN.) (INCH/HR) (INCH/HR)      (ACRES)  NODE
   1         5.51  13.61   3.486  0.25( 0.02)  0.10      1.8     10.00
   2         5.03   6.68   5.242  0.21( 0.02)  0.10      1.0     16.00

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

** PEAK FLOW RATE TABLE **
STREAM      Q      Tc  Intensity  Fp(Fm)      Ap      Ae      HEADWATER
NUMBER      (CFS) (MIN.) (INCH/HR) (INCH/HR)      (ACRES)  NODE
   1         9.10   6.68   5.242  0.23( 0.02)  0.10      1.9     16.00
   2         8.85  13.61   3.486  0.23( 0.02)  0.10      2.8     10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =          9.10      Tc(MIN.) =          6.68
EFFECTIVE AREA(ACRES) =          1.91      AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.23      AREA-AVERAGED Ap =    0.10
TOTAL AREA(ACRES) =          2.8
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      15.00 =    1100.00 FEET.

*****
FLOW PROCESS FROM NODE      15.00 TO NODE      18.00 IS CODE =  31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    25.80  DOWNSTREAM(FEET) =    11.50
FLOW LENGTH(FEET) =    82.00  MANNING'S N =    0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS    7.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    19.10
ESTIMATED PIPE DIAMETER(INCH) =    12.00      NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =          9.10
PIPE TRAVEL TIME(MIN.) =    0.07      Tc(MIN.) =    6.75
LONGEST FLOWPATH FROM NODE      10.00 TO NODE      18.00 =    1182.00 FEET.

*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE =  31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    11.50  DOWNSTREAM(FEET) =    11.10
FLOW LENGTH(FEET) =    80.00  MANNING'S N =    0.013

```

DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.97
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 9.10
PIPE TRAVEL TIME(MIN.) = 0.27 Tc(MIN.) = 7.02
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 19.00 = 1262.00 FEET.

FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<

=====

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.02
RAINFALL INTENSITY(INCH/HR) = 5.10
AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.91
TOTAL STREAM AREA(ACRES) = 2.81
PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.10

FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

A-10

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 40.00 DOWNSTREAM(FEET) = 33.50

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.783

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.195

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	D	1.60	0.20	0.100	91	6.78
COMMERCIAL	C	0.20	0.25	0.100	86	6.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.21

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100

SUBAREA RUNOFF(CFS) = 8.38

TOTAL AREA(ACRES) = 1.80 PEAK FLOW RATE(CFS) = 8.38

FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 17.50 DOWNSTREAM(FEET) = 11.30
FLOW LENGTH(FEET) = 56.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 15.69
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.38
PIPE TRAVEL TIME(MIN.) = 0.06 Tc(MIN.) = 6.84
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 22.00 = 386.00 FEET.

FLOW PROCESS FROM NODE 22.00 TO NODE 22.00 IS CODE = 81

```

-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
A-11
=====
MAINLINE Tc(MIN.) = 6.84
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.169
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
    LAND USE           GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"GRASS"                D        0.06      0.20      1.000    96
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.06      SUBAREA RUNOFF(CFS) = 0.27
EFFECTIVE AREA(ACRES) = 1.86    AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.13
TOTAL AREA(ACRES) = 1.9        PEAK FLOW RATE(CFS) = 8.61

*****
FLOW PROCESS FROM NODE 22.00 TO NODE 19.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 11.30 DOWNSTREAM(FEET) = 11.10
FLOW LENGTH(FEET) = 41.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 21.0 INCH PIPE IS 14.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.87
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.61
PIPE TRAVEL TIME(MIN.) = 0.14 Tc(MIN.) = 6.98
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 19.00 = 427.00 FEET.

*****
FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
A-12
=====
MAINLINE Tc(MIN.) = 6.98
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.110
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
    LAND USE           GROUP   (ACRES) (INCH/HR) (DECIMAL) CN
NATURAL FAIR COVER
"GRASS"                D        0.37      0.20      1.000    96
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 0.37      SUBAREA RUNOFF(CFS) = 1.63
EFFECTIVE AREA(ACRES) = 2.23    AREA-AVERAGED Fm(INCH/HR) = 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 2.2        PEAK FLOW RATE(CFS) = 10.14

*****
FLOW PROCESS FROM NODE 19.00 TO NODE 19.00 IS CODE = 1
-----
>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 6.98
RAINFALL INTENSITY(INCH/HR) = 5.11
AREA-AVERAGED Fm(INCH/HR) = 0.06

```

AREA-AVERAGED Fp(INCH/HR) = 0.20
AREA-AVERAGED Ap = 0.27
EFFECTIVE STREAM AREA(ACRES) = 2.23
TOTAL STREAM AREA(ACRES) = 2.23
PEAK FLOW RATE(CFS) AT CONFLUENCE = 10.14

**** CONFLUENCE DATA ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	9.10	7.02	5.095	0.23(0.02)	0.10	1.9	16.00
1	8.85	13.95	3.436	0.23(0.02)	0.10	2.8	10.00
2	10.14	6.98	5.110	0.20(0.06)	0.27	2.2	20.00

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

**** PEAK FLOW RATE TABLE ****

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	19.23	6.98	5.110	0.21(0.04)	0.19	4.1	20.00
2	19.22	7.02	5.095	0.21(0.04)	0.19	4.1	16.00
3	15.64	13.95	3.436	0.21(0.04)	0.18	5.0	10.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 19.23 Tc(MIN.) = 6.98
EFFECTIVE AREA(ACRES) = 4.13 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.21 AREA-AVERAGED Ap = 0.19
TOTAL AREA(ACRES) = 5.0
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 19.00 = 1262.00 FEET.

Area A

FLOW PROCESS FROM NODE 19.00 TO NODE 23.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<

ELEVATION DATA: UPSTREAM(FEET) = 11.10 DOWNSTREAM(FEET) = 11.00
FLOW LENGTH(FEET) = 26.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 30.0 INCH PIPE IS 20.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.46
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 19.23
PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 7.06
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 23.00 = 1288.00 FEET.

FLOW PROCESS FROM NODE 30.00 TO NODE 31.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

B-1

INITIAL SUBAREA FLOW-LENGTH(FEET) = 330.00
ELEVATION DATA: UPSTREAM(FEET) = 39.90 DOWNSTREAM(FEET) = 38.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.862

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.192

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	C	0.11	0.25	0.100	86	9.86

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25

SUBAREA AVERAGE PERVIOUS AREA FRACTION, $A_p = 0.100$
SUBAREA RUNOFF(CFS) = 0.41
TOTAL AREA(ACRES) = 0.11 PEAK FLOW RATE(CFS) = 0.41

B-1

```
*****
FLOW PROCESS FROM NODE    31.00 TO NODE    32.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 36.40 DOWNSTREAM(FEET) = 34.90
FLOW LENGTH(FEET) = 303.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 3.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.32
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.41
PIPE TRAVEL TIME(MIN.) = 2.17 Tc(MIN.) = 12.03
LONGEST FLOWPATH FROM NODE    30.00 TO NODE    32.00 = 633.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE    32.00 TO NODE    32.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 12.03
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.740
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/  SCS SOIL  AREA    Fp      Ap    SCS
    LAND USE        GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          C      0.22    0.25    0.100  86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.25
SUBAREA AVERAGE PERVIOUS AREA FRACTION,  $A_p = 0.100$ 
SUBAREA AREA(ACRES) = 0.22 SUBAREA RUNOFF(CFS) = 0.74
EFFECTIVE AREA(ACRES) = 0.33 AREA-AVERAGED Fm(INCH/HR) = 0.03
AREA-AVERAGED Fp(INCH/HR) = 0.25 AREA-AVERAGED  $A_p = 0.10$ 
TOTAL AREA(ACRES) = 0.3 PEAK FLOW RATE(CFS) = 1.10
```

B-2

```
*****
FLOW PROCESS FROM NODE    32.00 TO NODE    33.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 34.90 DOWNSTREAM(FEET) = 34.20
FLOW LENGTH(FEET) = 133.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 9.0 INCH PIPE IS 7.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.94
ESTIMATED PIPE DIAMETER(INCH) = 9.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.10
PIPE TRAVEL TIME(MIN.) = 0.75 Tc(MIN.) = 12.79
LONGEST FLOWPATH FROM NODE    30.00 TO NODE    33.00 = 766.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE    33.00 TO NODE    33.00 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 12.79
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.612
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/  SCS SOIL  AREA    Fp      Ap    SCS
    LAND USE        GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
```

B-3

```

COMMERCIAL          C          0.14      0.25      0.100      86      B-3
COMMERCIAL          D          0.30      0.20      0.100      91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.44      SUBAREA RUNOFF(CFS) = 1.42
EFFECTIVE AREA(ACRES) = 0.77      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 0.8      PEAK FLOW RATE(CFS) = 2.49

```

```

FLOW PROCESS FROM NODE      33.00 TO NODE      33.00 IS CODE = 81

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<      B-4

```

```

=====
MAINLINE Tc(MIN.) = 12.79
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.612
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL      AREA      Fp      Ap      SCS
    LAND USE      GROUP      (ACRES)      (INCH/HR)      (DECIMAL)      CN
COMMERCIAL          C          0.08      0.25      0.100      86
COMMERCIAL          D          0.16      0.20      0.100      91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.22
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.24      SUBAREA RUNOFF(CFS) = 0.78
EFFECTIVE AREA(ACRES) = 1.01      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.23      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.0      PEAK FLOW RATE(CFS) = 3.26

```

```

FLOW PROCESS FROM NODE      33.00 TO NODE      34.00 IS CODE = 31

```

```

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

```

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 34.20      DOWNSTREAM(FEET) = 33.00
FLOW LENGTH(FEET) = 237.00      MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.89
ESTIMATED PIPE DIAMETER(INCH) = 15.00      NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 3.26
PIPE TRAVEL TIME(MIN.) = 1.01      Tc(MIN.) = 13.80
LONGEST FLOWPATH FROM NODE      30.00 TO NODE      34.00 = 1003.00 FEET.

```

```

FLOW PROCESS FROM NODE      34.00 TO NODE      34.00 IS CODE = 81

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<      B-5

```

```

=====
MAINLINE Tc(MIN.) = 13.80
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.458
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL      AREA      Fp      Ap      SCS
    LAND USE      GROUP      (ACRES)      (INCH/HR)      (DECIMAL)      CN
COMMERCIAL          D          0.23      0.20      0.100      91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.23      SUBAREA RUNOFF(CFS) = 0.71
EFFECTIVE AREA(ACRES) = 1.24      AREA-AVERAGED Fm(INCH/HR) = 0.02
AREA-AVERAGED Fp(INCH/HR) = 0.22      AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.2      PEAK FLOW RATE(CFS) = 3.83

```

Area B

```

FLOW PROCESS FROM NODE    34.00 TO NODE    35.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    33.00  DOWNSTREAM(FEET) =    18.40
FLOW LENGTH(FEET) =    335.00  MANNING'S N =    0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS    6.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =    9.18
ESTIMATED PIPE DIAMETER(INCH) =    12.00  NUMBER OF PIPES =    1
PIPE-FLOW(CFS) =          3.83
PIPE TRAVEL TIME(MIN.) =    0.61  Tc(MIN.) =    14.41
LONGEST FLOWPATH FROM NODE    30.00 TO NODE    35.00 =    1338.00 FEET

```

Area B

```

FLOW PROCESS FROM NODE    50.00 TO NODE    51.00 IS CODE = 21
-----

```

```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

```

C-1

```

INITIAL SUBAREA FLOW-LENGTH(FEET) =    330.00
ELEVATION DATA: UPSTREAM(FEET) =    55.00  DOWNSTREAM(FEET) =    32.00

```

```

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.268
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =    6.005
SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS  Tc
    LAND USE            GROUP  (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL              D      0.63    0.20    0.100    91   5.27
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =    0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =    0.100
SUBAREA RUNOFF(CFS) =          3.39
TOTAL AREA(ACRES) =          0.63  PEAK FLOW RATE(CFS) =          3.39

```

```

FLOW PROCESS FROM NODE    51.00 TO NODE    51.00 IS CODE = 81
-----

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====

```

C-2

```

MAINLINE Tc(MIN.) =    5.27
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =    6.005
SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp          Ap      SCS
    LAND USE            GROUP  (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL              D      0.87    0.20    0.100    91
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =    0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =    0.100
SUBAREA AREA(ACRES) =    0.87  SUBAREA RUNOFF(CFS) =    4.69
EFFECTIVE AREA(ACRES) =    1.50  AREA-AVERAGED Fm(INCH/HR) =    0.02
AREA-AVERAGED Fp(INCH/HR) =    0.20  AREA-AVERAGED Ap =    0.10
TOTAL AREA(ACRES) =    1.5  PEAK FLOW RATE(CFS) =    8.08

```

```

FLOW PROCESS FROM NODE    51.00 TO NODE    52.00 IS CODE = 51
-----

```

```

>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<
>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<
=====

```

C-3

```

ELEVATION DATA: UPSTREAM(FEET) =    32.00  DOWNSTREAM(FEET) =    27.00
CHANNEL LENGTH THRU SUBAREA(FEET) =    247.00  CHANNEL SLOPE =    0.0202
CHANNEL BASE(FEET) =    2.00  "Z" FACTOR =    20.000

```

C-3

MANNING'S FACTOR = 0.015 MAXIMUM DEPTH(Feet) = 10.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.486
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	1.65	0.20	0.100	91

 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.14
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(Feet/Sec.) = 4.58
 AVERAGE FLOW DEPTH(Feet) = 0.32 TRAVEL TIME(MIN.) = 0.90
 Tc(MIN.) = 6.17
 SUBAREA AREA(ACRES) = 1.65 SUBAREA RUNOFF(CFS) = 8.12
 EFFECTIVE AREA(ACRES) = 3.15 AREA-AVERAGED Fm(INCH/HR) = 0.02
 AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 3.2 PEAK FLOW RATE(CFS) = 15.50
 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(Feet) = 0.35 FLOW VELOCITY(Feet/Sec.) = 4.83
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 577.00 FEET.

 FLOW PROCESS FROM NODE 52.00 TO NODE 53.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(Feet) = 23.00 DOWNSTREAM(Feet) = 21.80
 FLOW LENGTH(Feet) = 121.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.2 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 7.42
 ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 15.50
 PIPE TRAVEL TIME(MIN.) = 0.27 Tc(MIN.) = 6.44
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 53.00 = 698.00 FEET.

 FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 31

 >>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
 >>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
 =====
 ELEVATION DATA: UPSTREAM(Feet) = 21.80 DOWNSTREAM(Feet) = 20.00
 FLOW LENGTH(Feet) = 102.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 21.0 INCH PIPE IS 13.9 INCHES
 PIPE-FLOW VELOCITY(Feet/Sec.) = 9.17
 ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 15.50
 PIPE TRAVEL TIME(MIN.) = 0.19 Tc(MIN.) = 6.62
 LONGEST FLOWPATH FROM NODE 50.00 TO NODE 54.00 = 800.00 FEET.

 FLOW PROCESS FROM NODE 54.00 TO NODE 54.00 IS CODE = 81

 >>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<

C-4

=====
 MAINLINE Tc(MIN.) = 6.62
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.266
 SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	D	0.29	0.20	0.100	91

C-4

SUBAREA AVERAGE PERVIOUS LOSS RATE, F_p (INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, A_p = 0.100
SUBAREA AREA(ACRES) = 0.29 SUBAREA RUNOFF(CFS) = 1.37
EFFECTIVE AREA(ACRES) = 3.44 AREA-AVERAGED F_m (INCH/HR) = 0.02
AREA-AVERAGED F_p (INCH/HR) = 0.20 AREA-AVERAGED A_p = 0.10
TOTAL AREA(ACRES) = 3.4 PEAK FLOW RATE(CFS) = 16.24

```
*****
FLOW PROCESS FROM NODE    54.00 TO NODE    55.00 IS CODE = 31
-----
>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) =    20.00 DOWNSTREAM(FEET) =    16.70
FLOW LENGTH(FEET) =    36.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 10.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 17.04
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) =    16.24
PIPE TRAVEL TIME(MIN.) = 0.04 Tc(MIN.) = 6.66
LONGEST FLOWPATH FROM NODE    50.00 TO NODE    55.00 =    836.00 FEET.
```

Area C

```
*****
FLOW PROCESS FROM NODE    60.00 TO NODE    61.00 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 145.00
ELEVATION DATA: UPSTREAM(FEET) =    31.50 DOWNSTREAM(FEET) =    15.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.461
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.882
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/    SCS SOIL    AREA    Fp    Ap    SCS    Tc
LAND USE            GROUP    (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
PUBLIC PARK          D        0.19    0.20    0.850    91    5.46
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.850
SUBAREA RUNOFF(CFS) = 0.98
TOTAL AREA(ACRES) = 0.19 PEAK FLOW RATE(CFS) = 0.98
=====
```

D-1

```
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 5.46
EFFECTIVE AREA(ACRES) = 0.19 AREA-AVERAGED Fm(INCH/HR)= 0.17
AREA-AVERAGED Fp(INCH/HR) = 0.20 AREA-AVERAGED Ap = 0.850
PEAK FLOW RATE(CFS) = 0.98
```

Area D

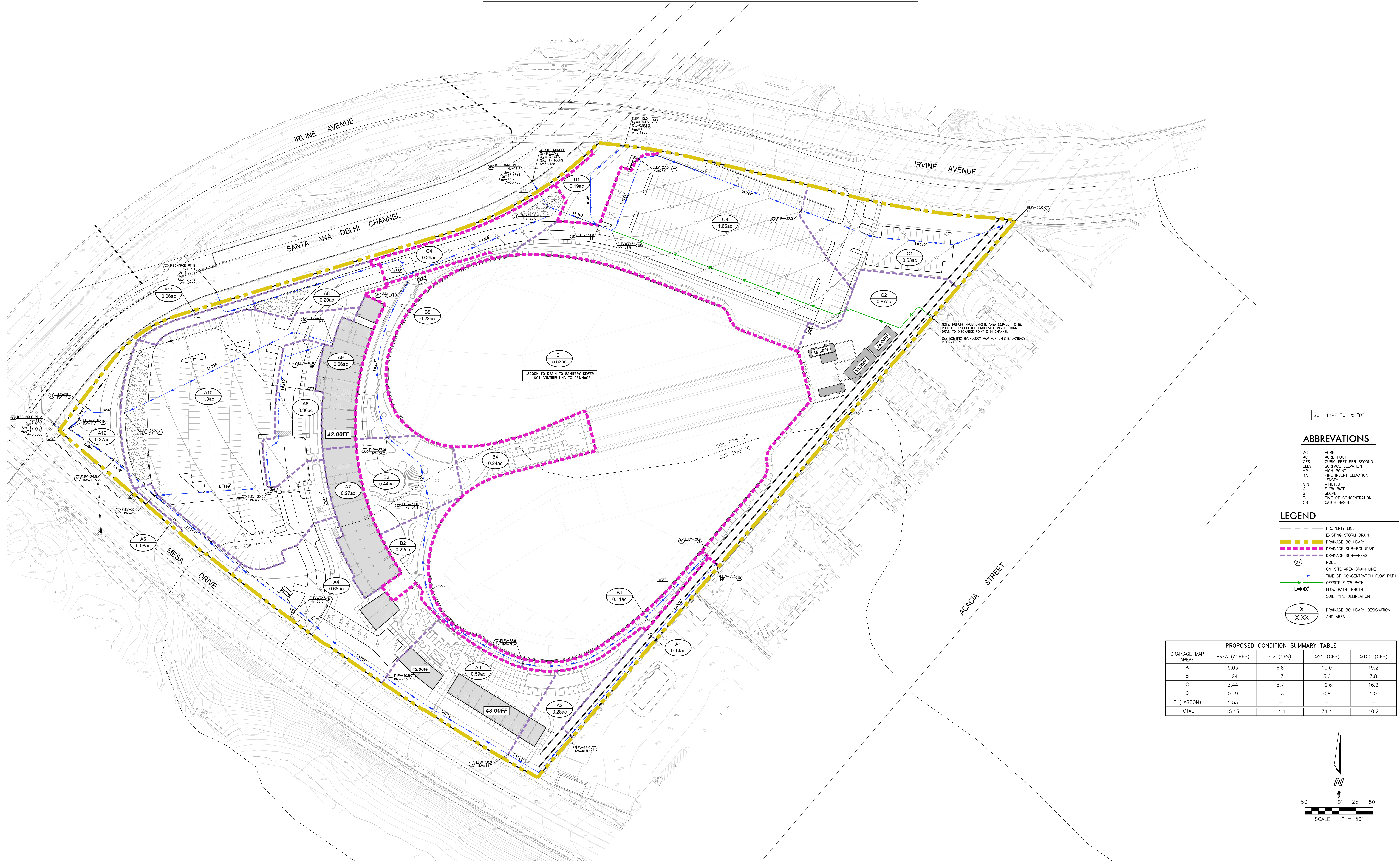
END OF RATIONAL METHOD ANALYSIS



Appendix 7

Proposed Condition Hydrology Map

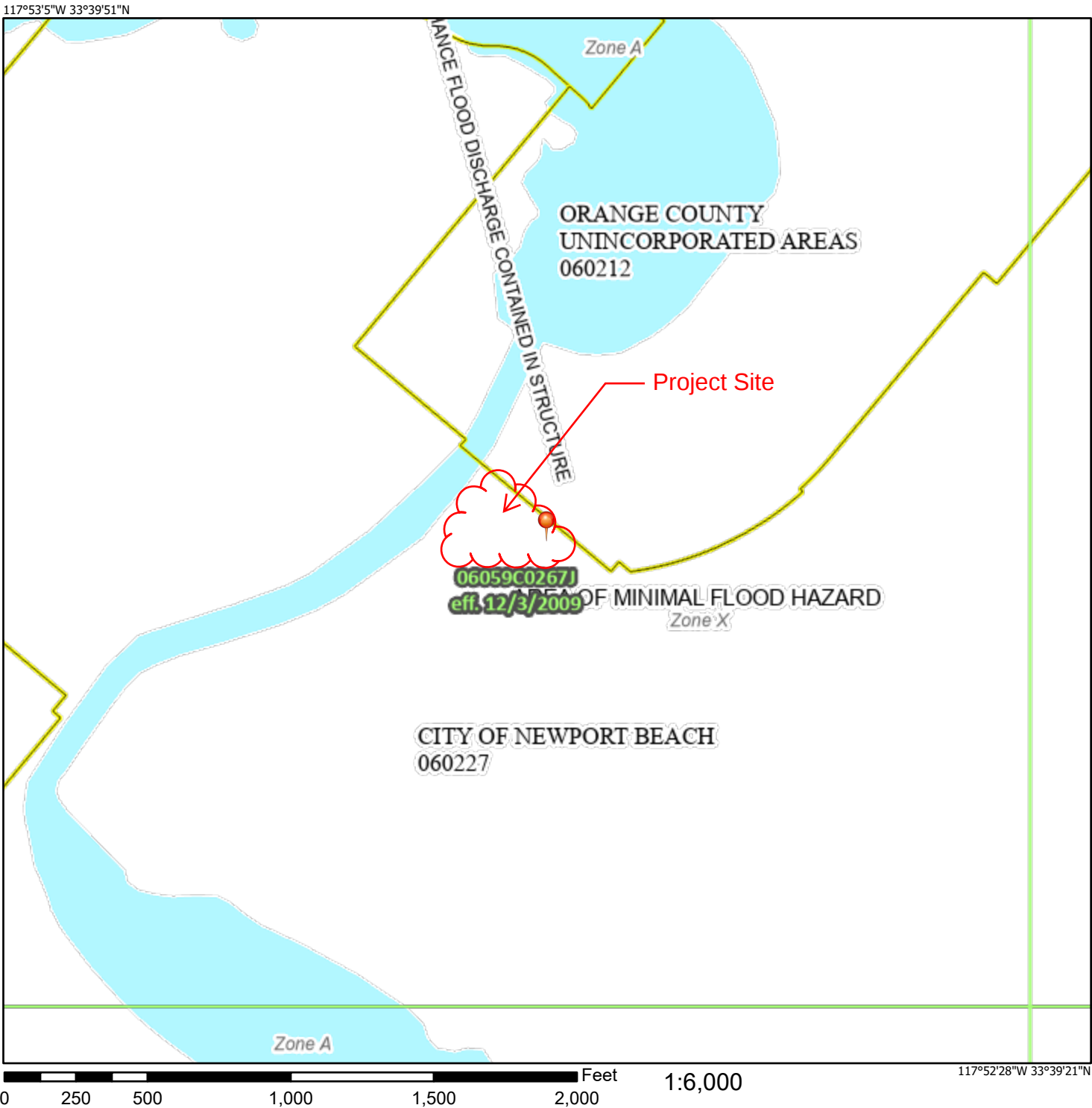
PROPOSED CONDITION HYDROLOGY



Appendix 8

FEMA Map

National Flood Hazard Layer FIRMMette



Legend

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

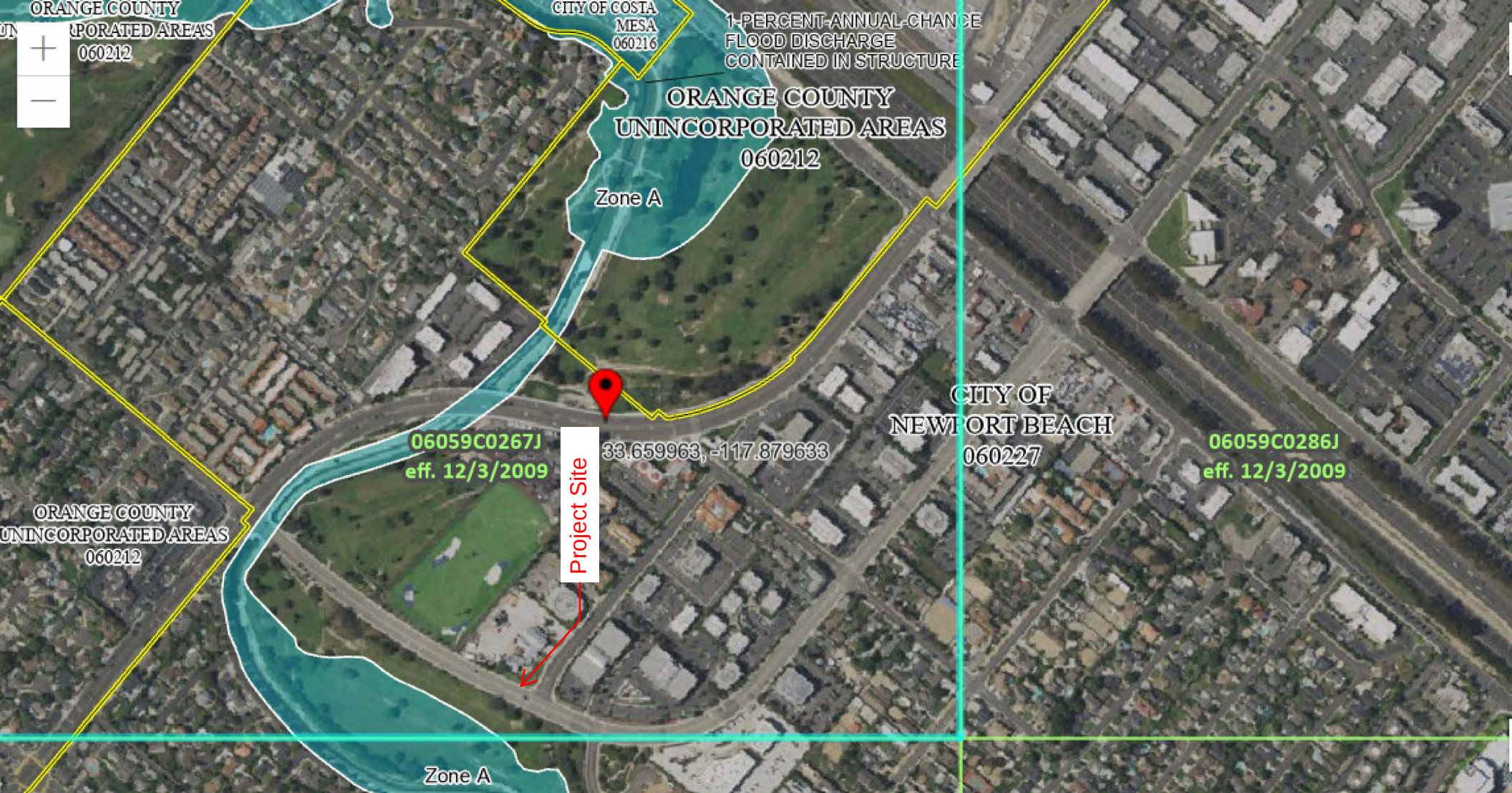
SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		Cross Sections with 1% Annual Chance Water Surface Elevation
MAP PANELS		Coastal Transect
		Base Flood Elevation Line (BFE)
OTHER FEATURES		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
OTHER FEATURES		Hydrographic Feature
		Digital Data Available
MAP PANELS		No Digital Data Available
		Unmapped

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **8/7/2024 at 12:55 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



Appendix 9

Hydraulic Calculations

Rating Table for Circular Pipe

Project Description

Friction Method Manning Formula
Solve For Full Flow Capacity

Input Data

Roughness Coefficient 0.010
Channel Slope 0.00500 ft/ft
Normal Depth 0.33 ft
Diameter 4.0 in
Discharge 0.17 ft³/s

Diameter (in)	Normal Depth (ft)	Discharge (ft ³ /s)	Velocity (ft/s)	Flow Area (ft ²)	Wetted Perimeter (ft)	Top Width (ft)
4.0	0.33	0.17	2.0	0.09	1.05	0.00
6.0	0.50	0.52	2.6	0.20	1.57	0.00
8.0	0.67	1.11	3.2	0.35	2.09	0.00
10.0	0.83	2.01	3.7	0.55	2.62	0.00
12.0	1.00	3.27	4.2	0.79	3.14	0.00
14.0	1.17	4.94	4.6	1.07	3.67	0.00
16.0	1.33	7.05	5.1	1.40	4.19	0.00
18.0	1.50	9.66	5.5	1.77	4.71	0.00