Area A-5 (NORTHERLY PARKING DECK)

BIO-2: Vegetated Swale; Biofiltration Swale

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

SIZING METHOD FOR VEGETATED SWALES (TGD APPENDIX XIV-55)

Step 1: Determine Design Flowrate (Q)
From Above, Q_{design} = 0.0825 cfs

Step 2: Estimate the Swale Bottom Width
Assume bottom width, b = 3.0'
Calculate design flow depth using assumed bottom width:
$Y = ((Q \times n_{WQ}) / (1.49 \times b \times s^{0.5}))^{0.6}$
Where,
Q = design flowrate, cfs
n_{WQ} = Manning's roughness coefficient for shallow flow conditions, 0.3 assumed for vegetated swale
b = estimated swale bottom width, ft
s = longitudinal slope in flow direction, ft/ft

$Y = ((0.0825 \text{ cfs} \times 0.3) / (1.49 \times 3' \times 0.03125^{0.5}))^{0.6}$
Y = 0.098'

Step 3: Determine Design Flow Velocity
$V_{WQ} = Q / A_{WQ}$

Where,
V_{WQ} = design flow velocity, fps
Q = design flowrate, cfs
$A_{WQ} = by + Zy^2$, cross sectional area of flow at design depth

$V_{WQ} = 0.0825 \text{ cfs} / (3' \text{x} 0.098' + 3 \times 0.098^2)$
$V_{WQ} = 0.256 \text{ fps} < 1.0 \text{ fps} \therefore$ velocity meets design parameters

Step 4: Calculate Swale Length
$L = 60 \times t_{HR} \times V_{WQ}$

Where,
L = swale length, ft
t_{HR} = hydraulic residence time, min (minimum 10 minutes)
V_{WQ} = design flow velocity, fps

L = 60 x 10 min. x x 0.256 fps
L = 153.6 ft minimum

$L_{provided}$ = 155' > 153.6'

Provide time of concentration assumptions:

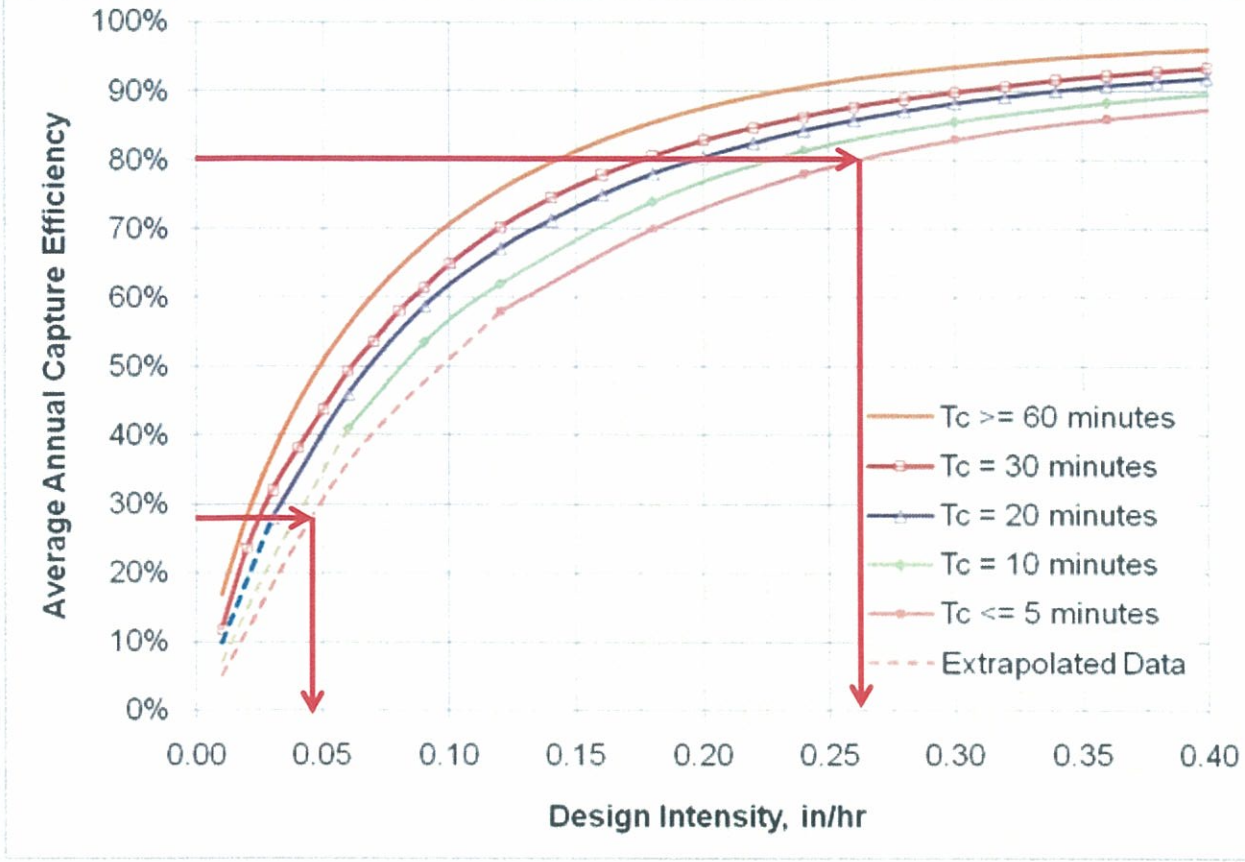
Tc = 5 minutes per Preliminary Hydrology Report calculations.

Area A-5 (NORTHERLY PARKING DECK)

BIO-2: Vegetated Swale; Biofiltration Swale

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Area A-6 (SOUTHERLY PARKING DECK)

BIO-1: BIORETENTION W/ UNDERDRAIN;
STORM WATER PLANTER IN TREATMENT TRAIN WITH FILTERRA CATCH BASIN

Worksheet E: Determining Capture Efficiency of Volume Based, Constant Drawdown BMP based on Design Volume

Storm Water Planters

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.80	inches
2	Enter the storage volume provided in the BMP, *V* (cu-ft)	V=	300	cu-ft
3	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.99	acres
4	Enter Project Imperviousness, *imp* (unitless)	imp=	90%	
5	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.825	
6	Calculate the effective design storm depth provided (inches), $d_{provided} = (V \times 12)/(C \times A \times 43560)$	$d_{provided}$=	0.101	inches
7	Calculate the design storm depth as a fraction of the design capture depth, $X_{fraction} = d_{provided}/d$	$X_{fraction}$=	0.126	
Step 2: Calculate the capture efficiency of the BMP system				
1	Determine the drawdown time of the proposed BMP based on equations provided in the applicable BMP Fact Sheet, *T* (hours)	T=	5	hours
2	Enter the effect of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	--	inches
3	Enter capture efficiency corresponding to d_{HSC} from Table 6.7 (regionally based), Y_1 (Worksheet A)	Y_1=	--	%
4	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the upstream capture efficiency(Y_1), X_1	X_1=	--	
5	Determine the fraction of design capture storm depth corresponding to the cumulative capture efficiency, $X_2 = X_1 + X_{fraction}$	X_2=	0.126	
6	Using Figure III.2, determine the capture efficiency corresponding to total fraction of design storm depth (X_2) for drawdown time (T), Y_2	Y_2=	45	%
Supporting Calculations				

Describe system:

Storm Water Planters, 12" ponding depths, combined area of 300 ft²
Treats 300 ft² in accordance with Fact Sheet BIO-1 for Capture Efficiency Method

$$dprovided = \frac{V\ (ft3) \times 12\ in/ft}{C \times A\ (ac) \times 43{,}560\ ft2/ac} = \frac{300 \times 12}{0.825 \times 0.99 \times 43{,}560} = 0.101$$

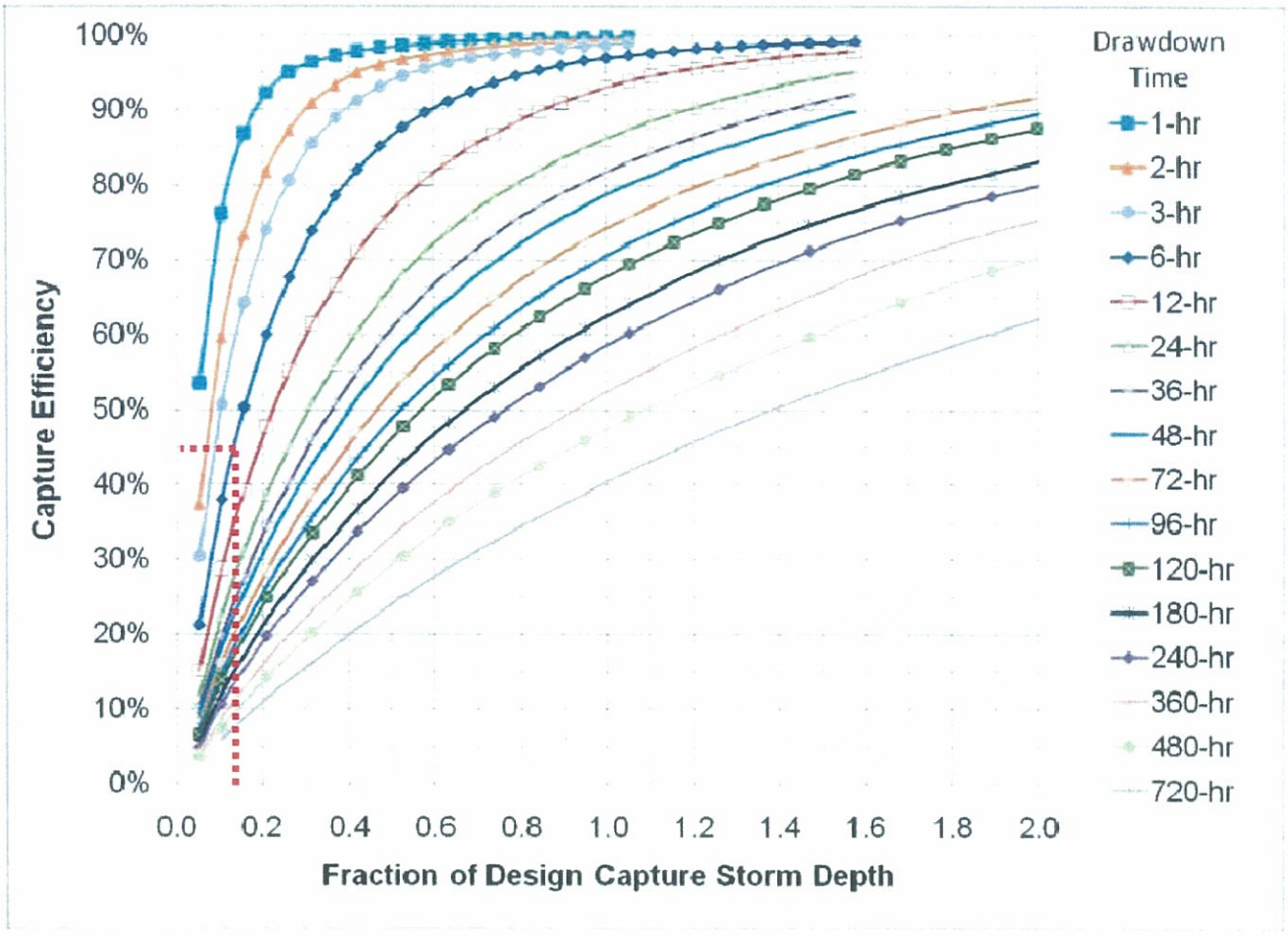
Provide drawdown calculations per equations in applicable BMP Fact Sheet:

12" ponding depth, per Fact Sheet BIO-1

$$Drawdown\ Time\ (hr) = \frac{1\ ft}{2.5\ in/hr} \times 12\frac{in}{ft} = 4.8\ hours\ (rounded\ up\ to\ 5)$$

Graphical Operations

Figure III.2. Capture Efficiency Nomograph for Constant Drawdown Systems in Orange County



Use this graph to provide the supporting graphical operations. See Example III.8.

Area A-6 (SOUTHERLY PARKING DECK)

BIO-7: Proprietary Biotreatment; Filterra System in treatment train with Storm Water Planter (provides 45% capture efficiency)

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

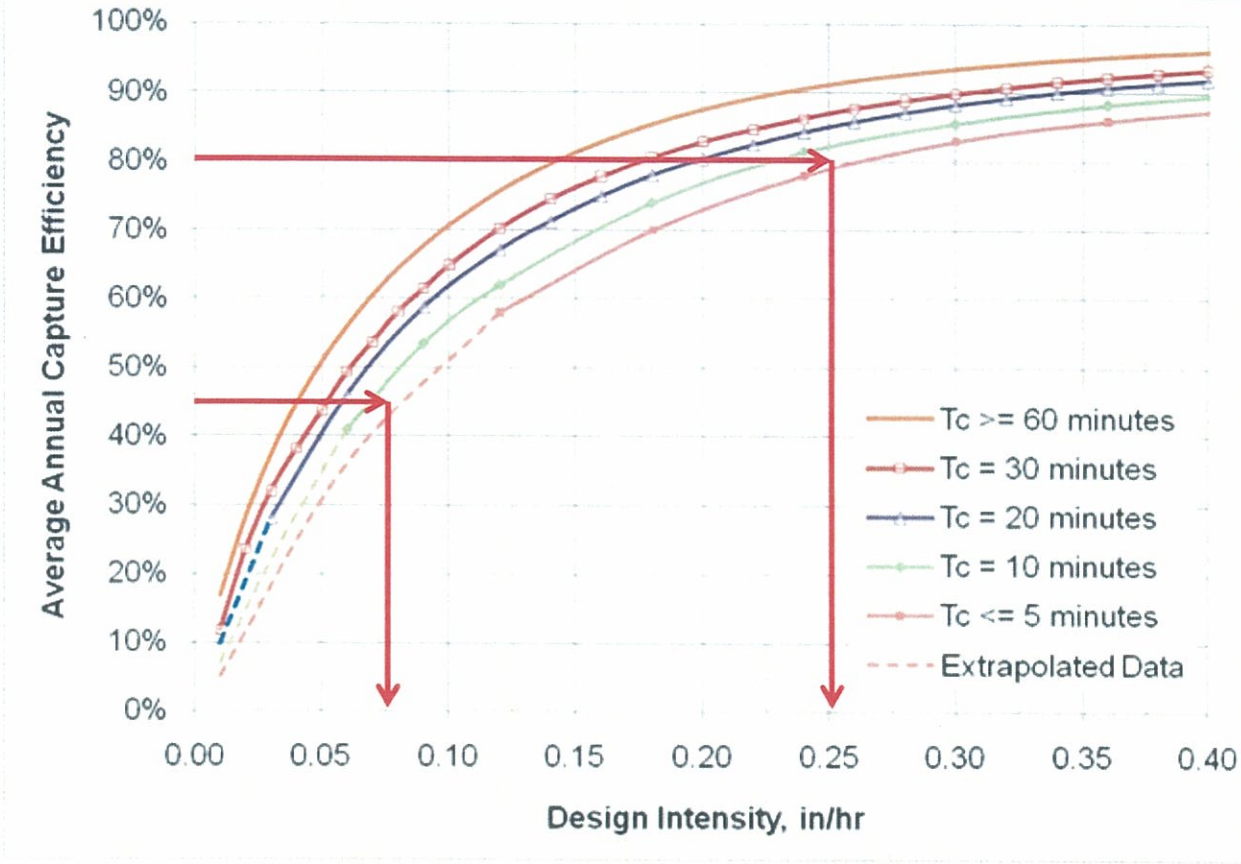
Step 1: Determine the design capture storm depth used for calculating volume				
1	*Enter the time of concentration, T_c (min) (See Appendix IV.2)*	T_c=	6.3	
2	*Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1*	I_1=	0.25	in/hr
3	*Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)*	d_{HSC}=	0.101	inches
4	*Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)*	Y_2=	45	%
5	*Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2*	I_2=	0.075	
6	*Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$*	I_{design}=	0.175	
Step 2: Calculate the design flowrate				
1	*Enter Project area tributary to BMP (s), A (acres)*	A=	0.99	acres
2	*Enter Project Imperviousness, imp (unitless)*	imp=	0.90	
3	*Calculate runoff coefficient, C= (0.75 x imp) + 0.15*	C=	.825	
4	*Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$*	Q_{design}=	0.14	cfs
Supporting Calculations				
Describe system: *Filterra Bioretention Unit 6' x 10' (Treats up to 0.14 cfs)*				
Provide time of concentration assumptions: *Tc = 6.3 minutes per Preliminary Hydrology Report calculations.*				

Area A-6 (SOUTHERLY PARKING DECK)

BIO-7: Proprietary Biotreatment; Filterra System in treatment train with Storm Water Planter (provides 45% capture efficiency)

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Area A-7

BIO-7: Proprietary Biotreatment; Filterra System

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	*Enter the time of concentration, T_c (min) (See Appendix IV.2)*	T_c=	7	
2	*Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1*	I_1=	0.25	in/hr
3	*Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)*	d_{HSC}=	-	inches
4	*Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)*	Y_2=	-	%
5	*Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2*	I_2=	-	
6	*Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$*	I_{design}=	0.25	
Step 2: Calculate the design flowrate				
1	*Enter Project area tributary to BMP (s), A (acres)*	A=	0.56	acres
2	*Enter Project Imperviousness, imp (unitless)*	imp=	90%	
3	*Calculate runoff coefficient, C= (0.75 x imp) + 0.15*	C=	0.825	
4	*Calculate design flowrate, Q_{design}= (C x i_{design} x A)*	Q_{design}=	0.116	cfs

Supporting Calculations

Describe system:

Two (2) Filterra Bioretention Unit in Sump Condition each 4' x 6' (Each Unit Treats up to 0.061 cfs)

Provide time of concentration assumptions:

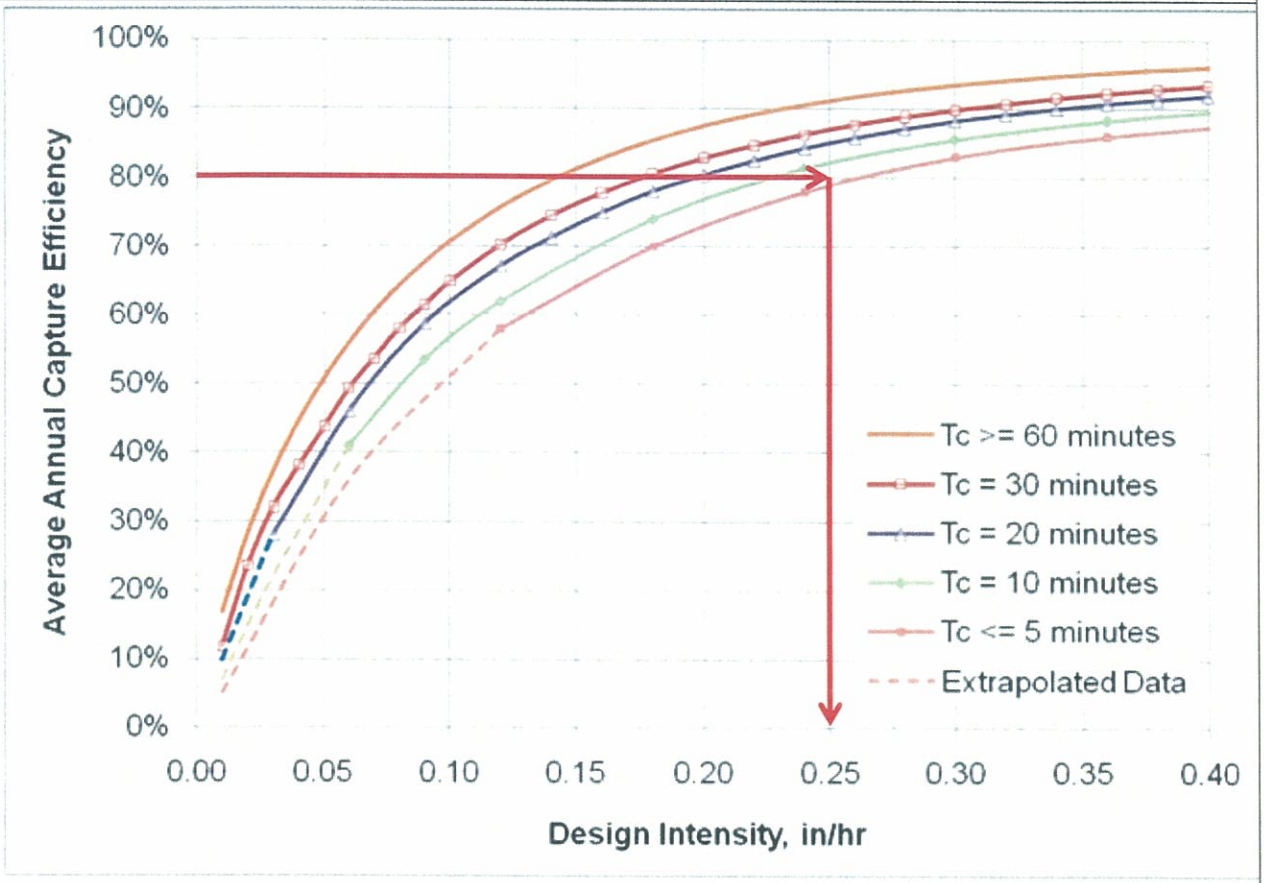
Tc = 7 minutes per Preliminary Hydrology Report calculations.

Area A-7

BIO-7: Proprietary Biotreatment; Filterra System

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Area A-8 (PRESCHOOL / ADMINISTRATION BUILDING)

BIO-7: Proprietary Biotreatment; Filterra Roofdrain System

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

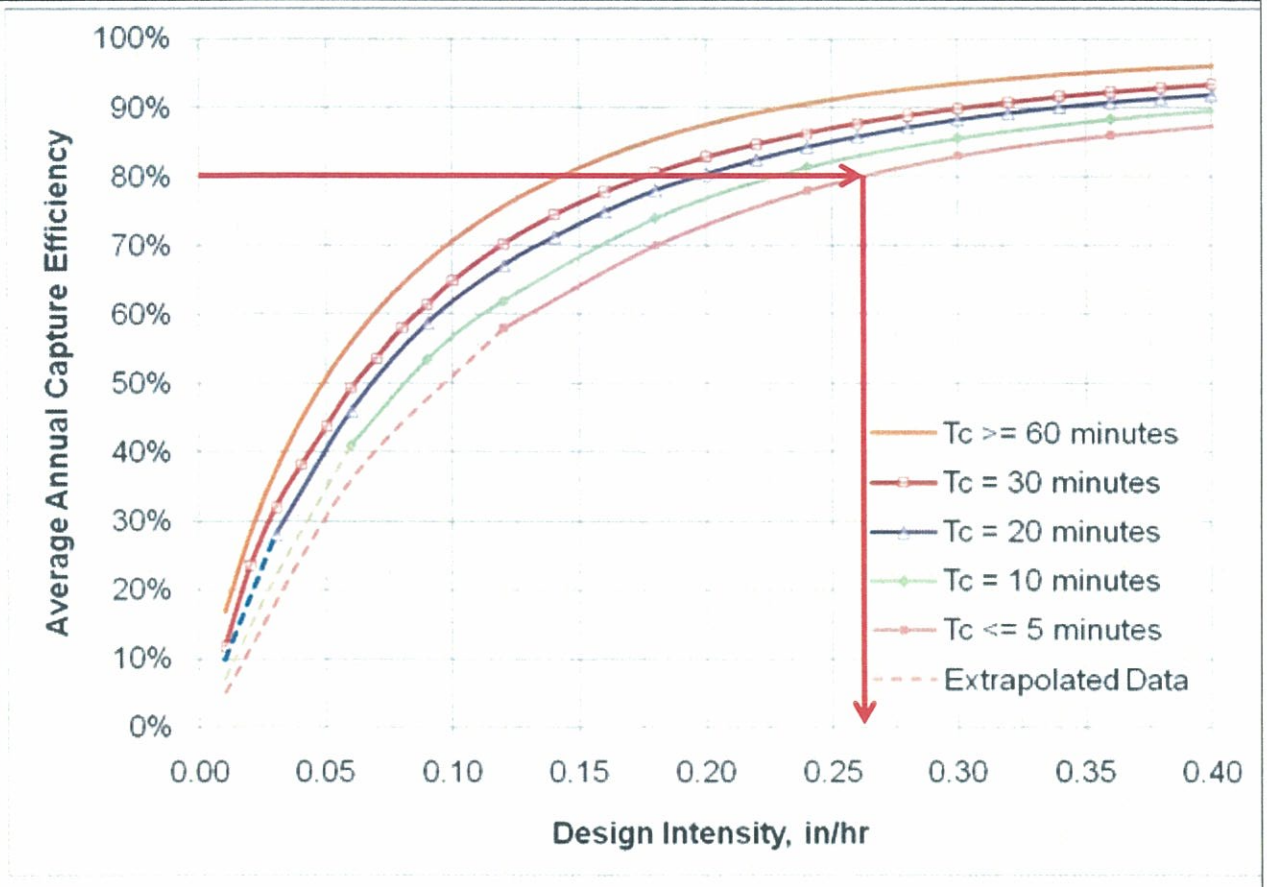
Step 1: Determine the design capture storm depth used for calculating volume				
1	*Enter the time of concentration, T_c (min) (See Appendix IV.2)*	T_c=	5	
2	*Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1*	I_1=	0.26	in/hr
3	*Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)*	d_{HSC}=	-	inches
4	*Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)*	Y_2=	-	%
5	*Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2*	I_2=	-	
6	*Determine the design intensity that must be provided by BMP, I_{design}= I_1-I_2*	I_{design}=	0.26	
Step 2: Calculate the design flowrate				
1	*Enter Project area tributary to BMP (s), A (acres)*	A=	0.23	acres
2	*Enter Project Imperviousness, imp (unitless)*	imp=	90%	
3	*Calculate runoff coefficient, C= (0.75 x imp) + 0.15*	C=	0.825	
4	*Calculate design flowrate, Q_{design}= (C x i_{design} x A)*	Q_{design}=	0.049	cfs
Supporting Calculations				
Describe system: *Filterra Bioretention Unit 4' x 6' (Treats up to 0.061 cfs)*				
Provide time of concentration assumptions: *Tc = 5 minutes per Preliminary Hydrology Report calculations.*				

Area A-8 (PRESCHOOL / ADMINISTRATION BUILDING)

BIO-7: Proprietary Biotreatment; Filterra Roofdrain System

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Area B-1 (LANDSCAPED AREA EAST OF CHRISTIAN EDUCATION BUILDINGS 1 AND 2)

Worksheet A: Hydrologic Source Control Calculation Form

Drainage area ID	**B-1**	
Total drainage area	0.30	acres
Total drainage area Impervious Area (IA_{total})	0.08	acres

HSC ID	HSC Type/ Description/ Reference BMP Fact Sheet	Effect of individual HSC_i per criteria in BMP Fact Sheets (XIV.1) (d_{HSCi})[1]	Impervious Area Tributary to HSC_i (IA_i)	$d_i \times IA_i$
B-1	HCS-2: Impervious Area Dispersion; Ratio = 3.67 Self-Retaining	1.0"	0.08	0.08
Box 1:		$\sum d_i \times IA_i =$		.08
Box 2:		$IA_{total} =$		.08
[Box 1]/[Box 2]:		$d_{HSC\ total} =$		1.0
		*Percent Capture Provided by HSCs (*Table III.1*)*		80%

1 - For HSCs meeting criteria to be considered self-retaining, enter the DCV for the project.
DCV = 0.30 ac x (0.21*0.75 + 0.15) x (0.80 inches) x 43,560 sf/ac x 1/12 in/ft = 267 cu-ft

- Self-treating area; No additional BMPs needed

Area B-2 (EXISTING SANCTUARY)

BIO-1: Bioretention w/ Underdrain; Downspout Planter Boxes

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	5	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.35	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	-	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	-	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	-	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = $X_1 - X_2$	fraction=	0.35	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$= *fraction* × *d*	$d_{fraction}$=	0.28	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.17	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.9	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.825	
4	Calculate runoff volume, V_{design}= (C x $d_{rfraction}$ x A x 43560 x (1/12))	V_{design}=	142	cu-ft

Supporting Calculations

Provide drawdown time calculations per applicable BMP Fact Sheet:

DD = (d_p / K_{design}) x 12 in/ft
DD = Time to completely drain infiltration basin ponding depth, hours
D_p = Ponding Depth = 1 ft
K_{design} = Infiltration Rate = Assume 2.5 in/hr

DD = (1 ft / 2.5 in/hr) x 12 in/ft = 4.8 hr Round Up to 5 hr

DD = 5.0 hr
From Step 4, Design Volume = fraction of DCV, adjusted for drawdown = 142 cu-ft

To Determine the Basin Infiltration Area Needed, A = Design Volume / dp

A = 142 cu-ft / 1 ft

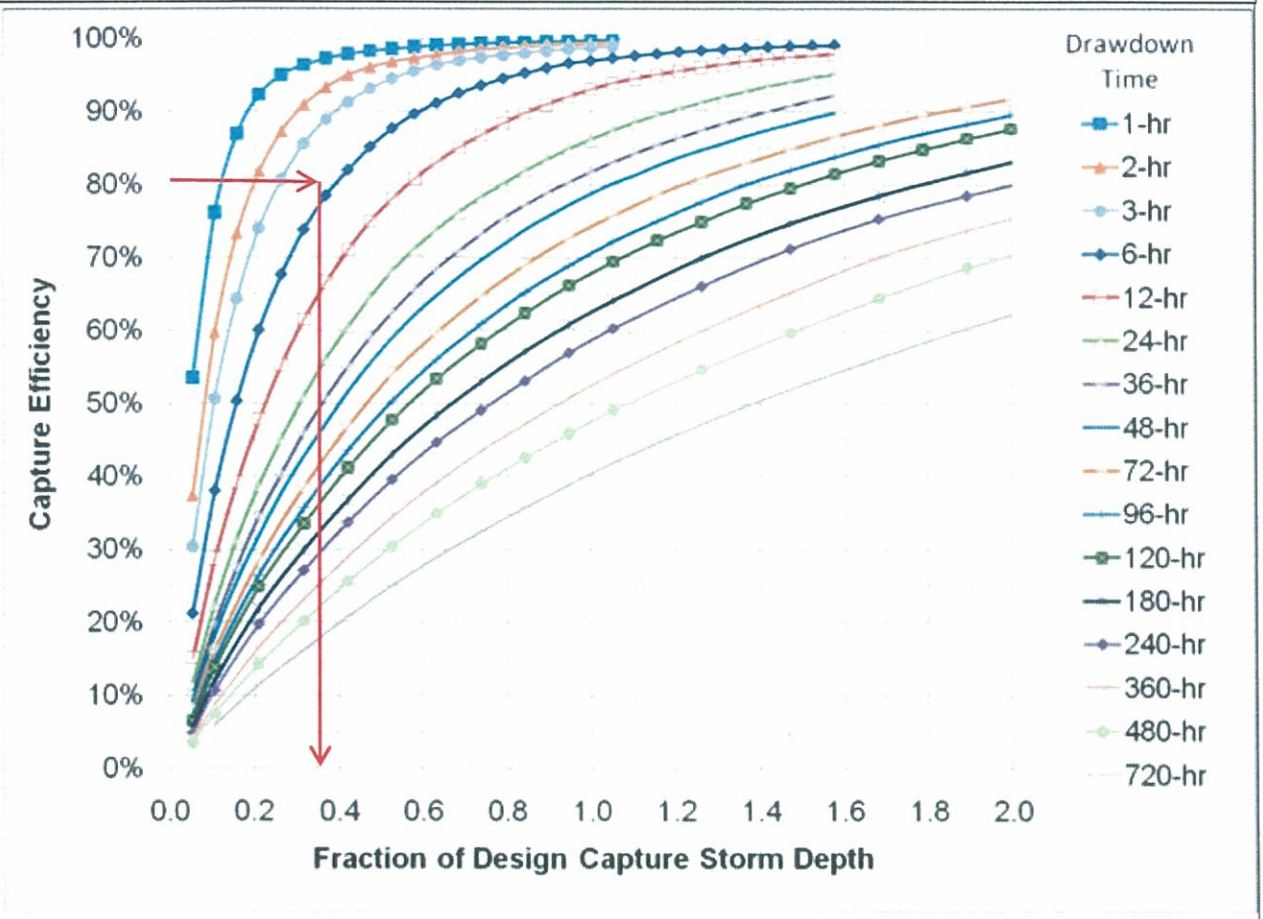
Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Area Needed = 142 square feet

A downspout planter box with underdrain will be constructed at the north-easterly corner of the existing sanctuary where the existing roof drains will be modified to drain through the planter box.
Footprint area of the BMP is approximately: **340 sf = Area Provided**

340 sf > 142 sf
$A_{provided} > A_{required}$

Graphical Operations



Provide supporting graphical operations. See Example III.6.

Area B-3 (EXISTING SANCTUARY)

BIO-1: Bioretention w/ Underdrain; Downspout Planter Boxes

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	5	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.35	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	-	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	-	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	-	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = X_1 - X_2	fraction=	0.35	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$= *fraction* × *d*	$d_{fraction}$=	0.28	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.17	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.9	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.825	
4	Calculate runoff volume, V_{design}= *(C x* $d_{rfraction}$ *x A x 43560 x (1/12))*	V_{design}=	142	cu-ft

Supporting Calculations

Provide drawdown time calculations per applicable BMP Fact Sheet:

DD = (d_p / K_{design}) x 12 in/ft
DD = Time to completely drain infiltration basin ponding depth, hours
D_p = Ponding Depth = 1 ft
K_{design} = Infiltration Rate = Assume 2.5 in/hr

DD = (1 ft / 2.5 in/hr) x 12 in/ft = 4.8 hr Round Up to 5 hr

DD = 5.0 hr
From Step 4, Design Volume = fraction of DCV, adjusted for drawdown = 142 cu-ft

To Determine the Basin Infiltration Area Needed, A = Design Volume / dp

A = 142 cu-ft / 1 ft

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

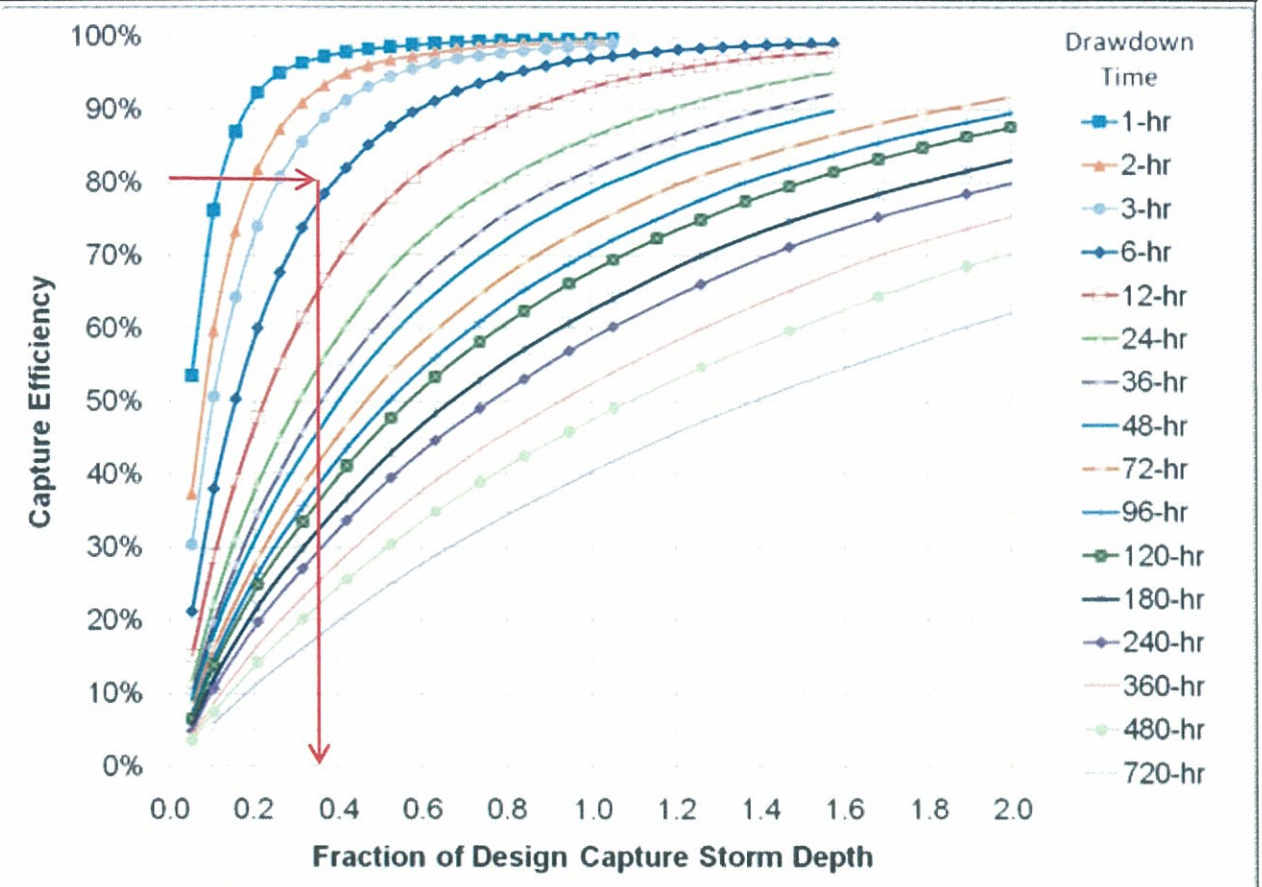
Area Needed = 142 square feet

A downspout planter box with underdrain will be constructed at the southerly corner of the existing sanctuary where the existing roof drains will be modified to drain through the planter box. Footprint area of the BMP is approximately: **288 sf = Area Provided**

288 sf > 142 sf

$A_{provided} > A_{required}$

Graphical Operations



Provide supporting graphical operations. See Example III.6.

Area B-4 (HARDSCAPE / LANDSCAPE AREA SOUTH-EAST OF EXISTING SANCTUARY)

BIO-1: Bioretention w/ Underdrain; Storm Water Planter

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.8	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	5	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.35	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	-	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)	Y_2=	-	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=	-	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = $X_1 - X_2$	fraction=	0.35	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$= *fraction* × *d*	$d_{fraction}$=	0.28	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.10	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	0.7	
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.675	
4	Calculate runoff volume, V_{design}= *(C x* $d_{rfraction}$ *x A x 43560 x (1/12))*	V_{design}=	69	cu-ft

Supporting Calculations

Provide drawdown time calculations per applicable BMP Fact Sheet:

DD = (d_p / K_{design}) x 12 in/ft
DD = Time to completely drain infiltration basin ponding depth, hours
D_p = Ponding Depth = 1 ft
K_{design} = Infiltration Rate = Assume 2.5 in/hr

DD = (1 ft / 2.5 in/hr) x 12 in/ft = 4.8 hr Round Up to 5 hr

DD = 5.0 hr
From Step 4, Design Volume = fraction of DCV, adjusted for drawdown = 69 cu-ft

To Determine the Basin Infiltration Area Needed, A = Design Volume / dp

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

A = 69 cu-ft / 1 ft

Area Needed = 69 square feet

A storm water planter with underdrain will be constructed at east of the hardscape area between the sanctuary and preschool/administration building

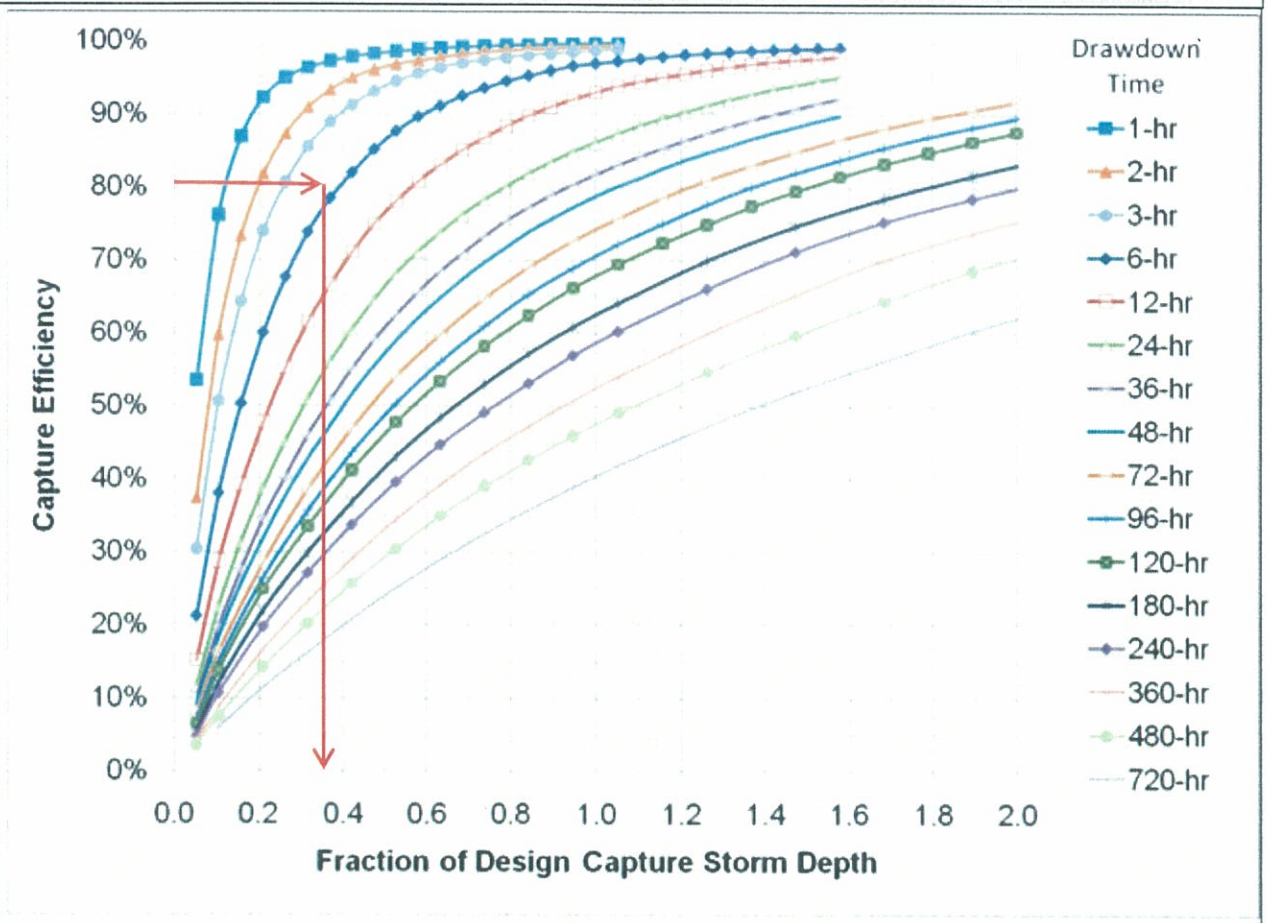
.

Footprint area of the BMP is approximately: **228 sf = Area Provided**

228 sf > 142 sf

$A_{provided} > A_{required}$

Graphical Operations



Provide supporting graphical operations. See Example III.6.

Area B-5 (MEDITATION GARDEN)

BIO-7: Proprietary Biotreatment; Filterra System

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

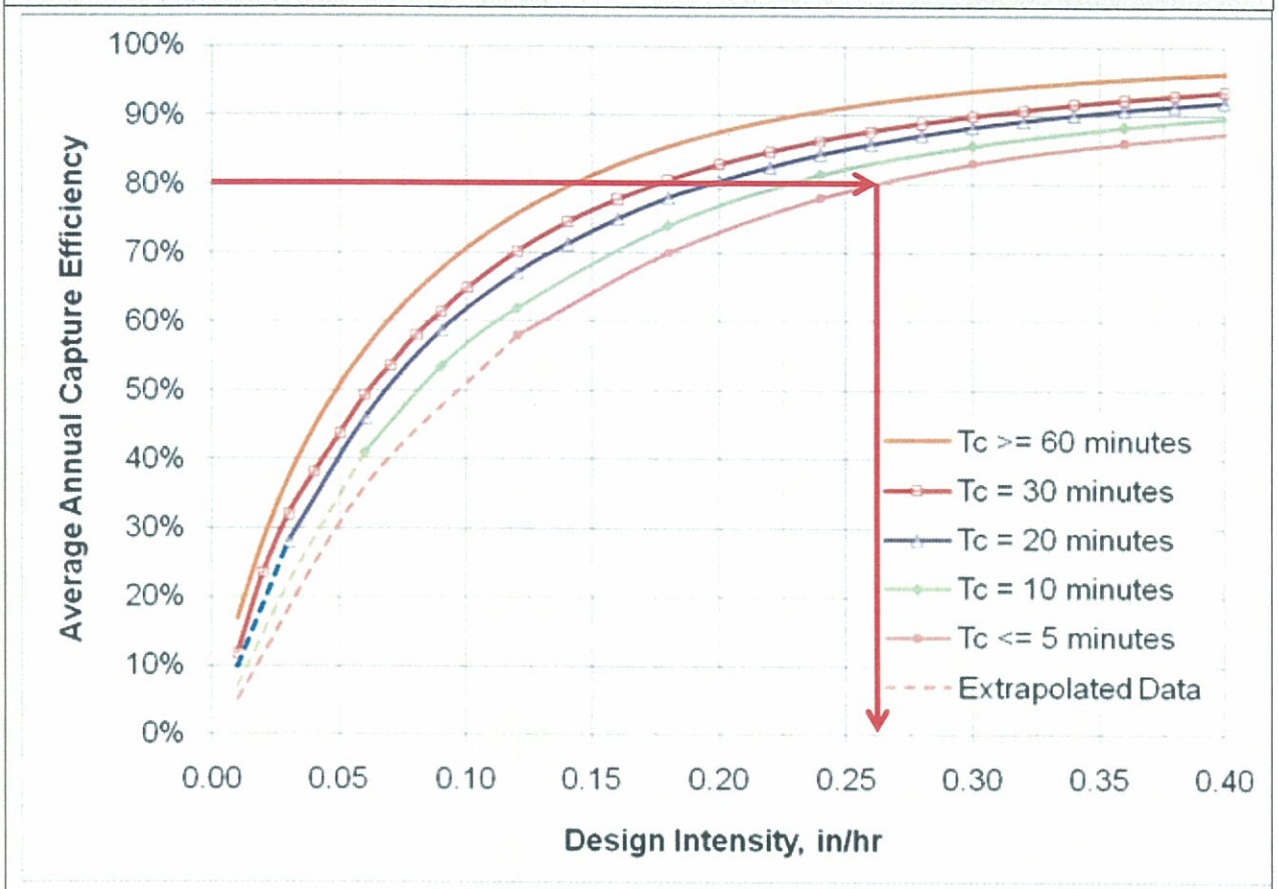
Step 1: Determine the design capture storm depth used for calculating volume				
1	*Enter the time of concentration, T_c (min) (See Appendix IV.2)*	T_c=	5	
2	*Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1*	I_1=	0.26	in/hr
3	*Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)*	d_{HSC}=	-	inches
4	*Enter capture efficiency corresponding to d_{HSC}, Y_2 (Worksheet A)*	Y_2=	-	%
5	*Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2*	I_2=	-	
6	*Determine the design intensity that must be provided by BMP, $I_{design}= I_1-I_2$*	I_{design}=	0.26	
Step 2: Calculate the design flowrate				
1	*Enter Project area tributary to BMP (s), A (acres)*	A=	0.18	acres
2	*Enter Project Imperviousness, imp (unitless)*	imp=	85%	
3	*Calculate runoff coefficient, C= (0.75 x imp) + 0.15*	C=	0.788	
4	*Calculate design flowrate, $Q_{design}= (C \times i_{design} \times A)$*	Q_{design}=	0.037	cfs
Supporting Calculations				
Describe system: *Filterra Bioretention Unit 4' x 4' (Treats up to 0.037 cfs)*				
Provide time of concentration assumptions: *Tc = 5 minutes per Preliminary Hydrology Report calculations.*				

Area B-5 (MEDITATION GARDEN)

BIO-7: Proprietary Biotreatment; Filterra System

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Sizing for Hydrodynamic Separation Device (PRE-1) - *CDS Unit - BMP-4*:

Pre-treatment, upstream Treatment-train
Upstream of Underground Detention Basin

The Water Quality Flow Rate Method will be used to determine CDS system sizing. A Flowrate-Based BMP sizing method will be used to determine Qd. The CDS will be designed to treat all flows up to the Qd. At influent rates higher than the Qd, the diversion weir will direct most flow exceeding the treatment flow rate around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Hydrodynamic Separation Device
CDS Unit
South Shores Church Project - City of Dana Point

Area	Acres	DCV in (cu-ft)	Qd in (cfs)
Drainage Area "A"			
A-1 through A-8	4.0	10,454	0.90

CDS Unit CDS3020 has a rated treated capacity of 2.0 cfs, which exceeds the required design flow of 0.90 cfs.

The CDS Unit CDS3020 has a maximum hydraulic internal bypass capacity of 20.00 cfs. The project's 100-year storm frequency design flow is 18.25 cfs passing through the proposed CDS unit (See Drainage Study in Appendix B).

6.3.3 LOCATION

For on-site Drainage Areas A and B, a combination of Bioretention with Underdrains (BIO-1), Vegetated Swales (BIO-2), Proprietary Biotreatments (BIO-7), and Hydrodynamic Separations Device (PRE-1) will be used as Treatment Control BMPs.

Bioretention with Underdrain BMPs (BIO-1) will include downspout planter boxes serving the roof drains of the proposed Community Life Center (Area A-1) and the existing Sanctuary (Area B-2 and B-3

Proprietary Biotreatment BMPs (BIO-7) will incorporate a combination of Filterra Roofdrain System and Filterra Catch Basin System. Both the Christian Education Buildings (Area A-2 and A-3) and the Preschool/Administration Building's (Area A-8) roofs will drain into Filterra Roofdrain systems before entering into the sites underground storm drain system. The site's main entry street and parking (Area A-4 and A-7) will drain to Filterra Catch Basins before entering the underground storm drain system.

The proposed parking deck is split into two subareas. Area A-5 will drain towards Crown Valley to a Vegetated Swale (BIO-2), such as a bioswale – BMP-2. Area A-6 drains towards Crown Valley to a storm water planter, which treats a portion of the design capture volume. Because of the larger area, a Proprietary Biotreatment Device (BIO-7), such as a Filterra Unit, is included to treat the remaining volume. Larger storm events can bypass these BMPs to proposed catch basins and will flow towards the underground detention basin via RCP Storm Drain.

A Hydrodynamic Separation Device (PRE-1), such as a CDS Unit - BMP-4, will be designed and implemented upstream of the proposed underground detention basin. All flows from Area A will be treated prior to entering the CDS unit. The CDS Unit acts as a pre-treatment device primarily for the underground detention basin.

The landscaped area to the east of the Christian Education Building (Area B-1) is a self-treating area that uses impervious area dispersion into landscaping.

The walkway area to the east of the existing Sanctuary (Area B-4) will drain towards a Bioretention with Underdrain BMP (BIO-1), such as a storm water planter with underdrain.

Lastly, the Meditation Garden (Area B-5) will incorporate a Proprietary Biotreatment BMP (BIO-7), such as a Filterra Box, which all area drains will be directed towards before entering the sites underground storm drain.

See WQMP Exhibit for BMP locations on Section 7.1

6.3.4 RESTRICTIONS ON USE OF INFILTRATION BMPS

The proposed project does not include infiltration BMPs. See Table 2.7: Infiltration BMP Feasibility Worksheet in Appendix D.

Section 7 Project Plans and BMP Location Map

SECTION 7

PROJECT PLANS AND BMP LOCATION MAP ON FILE WITH THE CITY OF DANA POINT

Section 8 Stormwater BMP Maintenance

The City does not accept stormwater structural BMPs as meeting the WQMP requirements standard, unless an Operations and Maintenance (O&M) Plan is prepared and a mechanism is in place that will ensure ongoing long-term maintenance of all structural and non-structural BMPs.

Operation and maintenance details are not required to be included with the Preliminary WQMP, but will be required as part of the Final WQMP.

8.1 Operation and Maintenance (O&M) Plan

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Responsible Party

The responsible party for implementation of this WQMP is:

Name: G.G. Kohlhagen

Title: Building Committee Chairman / Church Project Manager

Company: South Shores Church

Address: 32712 Crown Valley Parkway, Dana Point, CA 92629

Telephone #: 714-404-4962

Email Address: ggkohlhagen@cox.net

8.1.2 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A Training Log and Inspection and Maintenance Log are included in Appendix E of this document.

The **WQMP Verification Form** (Appendix F) shall be completed accurately and submitted, with associated documentation, to the City of Dana Point by September 30 of each year, or as requested by the City. **Failure to complete and submit the verification form will result in a noncompliance and enforcement actions may be taken.**

8.1.3 Vector Control

Standing water which exists for longer than 72 hours may contribute to mosquito breeding areas. Best Management Practices (BMPs) shall be inspected for standing water on a regular basis. Standing water may indicate that the BMP is not functioning properly and proper action to remedy the situation shall be taken in a timely manner.

Elimination of standing water and managing garbage, lawn clippings, and pet droppings, can help decrease the presence of mosquitoes and flies in the area.

The Orange County Vector Control District may be contacted for more information and support at 714-971-2421 or 949-654-2421 or www.ocvcd.org.

8.1.4 Required Permits

No other permits from other agencies besides the City of Dana Point are required.

8.1.5 Inspections

The City may conduct a site inspection to evaluate compliance with the Project WQMP, at any time, in accordance with Dana Point Municipal Code Chapter 15.10, Storm Water/Surface Runoff Water Quality.

8.1.6 Operation and Maintenance Requirements

Operation and maintenance details are not required to be included with the Preliminary WQMP, but will be required as part of the Final WQMP.

The South Shores Church will provide funding for all proposed BMPs and South Shores Church maintenance personnel and hired waste removal company will be maintain the project site.

BMP	Implementation, Inspection and Maintenance Requirements	Frequency
N1. Education for Property Owners, Tenants and Occupants	RP will insure that all owners & tenants will be given a copy of the recorded CC&R's which will contain a section outlining the environmental awareness education materials at the close of escrow. RP shall distribute appropriate materials to owners, tenants and/or occupants via contract language, mailings, website or meeting. Brochures can be requested or downloaded from www.ocwatersheds.com. Brochures and educational articles for RP distribution can also be requested from City Water Quality Engineer.	Information to be initially provided to owners & tenants upon sale or lease agreement. Educational materials will be provided to owners and/or tenants annually, thereafter.
N2. Activity Restriction	Within the CC&R's or lease agreement, the following activity restrictions shall be enforced:	Continuous

BMP	Implementation, Inspection and Maintenance Requirements	Frequency
N3. Common Area Landscape Management & Efficient Landscape Design	Landscape Management Includes: • Mitigation of the potential dangers of fertilizer and pesticide usage through the incorporation of an Integrated Pest Management Program (IPM). • Monitor for runoff and efficiency regularly. • Implementation of a water budget. • Irrigation systems shall be automatically controlled and designed, installed, and maintained so as to minimize overspray and runoff onto streets, sidewalks, driveways, structures, windows, walls, and fences. • Use of native and drought tolerant species when replanting	Inspected once a weeK
N11. Common Area Litter Control	Weekly sweeping and trash pick up as necessary within all project areas and common landscape areas. Daily inspection of trash receptacles to ensure that lids are closed and pick up any excess trash on the ground, noting trash disposal violations by homeowners and reporting the violations to the HOA/RP for investigation.	Daily inspection and weekly sweeping and clean-up or as needed
N12. Contractor/Employee Training	All contractors shall be trained and made aware of this WQMP and operation and maintenance requirements of BMPs.	At first hire and annually thereafter for HOA personnel and employees, to include the educational materials contained in the approved Water Quality Management Plan.
N13. Housekeeping of Loading Docks		
N14. Common Area Catch Basin Inspection	Catch basins will be owned, inspected and maintained by the HOA/RP. Catch basins will be inspected at a minimum on a yearly basis, and prior to the storm season, no later than October 1st of each year.	At a minimum, basins will be inspected and cleaned around October 1ST of each year, prior to "first flush" storm, or as necessary after large storm events to clear inlets of trash, debris and silt.

BMP	Implementation, Inspection and Maintenance Requirements	Frequency
N15. Street Sweeping Private Streets and Parking Lots	Vacuum street sweeping will occur on a weekly basis.	Streets will be vacuum swept on a weekly basis.
SD-13 Provide Storm Drain System Stenciling and Signage	All catch basins where applicable in paved areas, will be marked or stenciled with "No Dumping - Drains to Ocean, No Descargue Basura" language. This will be done in a location that can be clearly seen by all and will be routinely inspected and re-labeled, as necessary. Thereafter, the owner/operator shall routinely inspect and re-label the catch basins, as necessary.	Catch basin labels will be inspected once annually and relabeled as necessary to maintain legibility.
SD-34 Design and Construct Outdoor Material Storage Areas to Reduce Pollutant Introduction		
Sd-32 Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction	Trash will be removed by the local private solid waste management contractor on a weekly basis for proper disposal of the trash to landfill; with recyclable materials and greenwastes to be processed offsite.	Trash dumpster shall be kept in a non-leaking condition.
SD-31 Loading Docks		
SD-31 Maintenance Bays		
SD-33 Vehicle Wash Areas		
SD-36 Outdoor Processing Areas		
SD-33 Equipment Wash Areas		
SD-30 Fueling Areas		
Wash Water Controls for Food Preparation Areas		
Hydromod/LID/Treatment BMP # 1 Downspout Planter Box (BIO)		As recommended.

BMP	Implementation, Inspection and Maintenance Requirements	Frequency
Hydromod/LID/Treatment BMP # 2 Proprietary Bio-filtration, such as Filterra Systems (BIO)	**Included Maintenance** A. Each correctly installed Filterra® unit is to be maintained by the Supplier, or a Supplier approved contractor for a minimum period of 1 year. The cost of this service is to be included in the price of each Filterra® unit. Extended maintenance contracts are available at extra cost upon request. B. Annual included maintenance consists of a maximum of (2) scheduled visits. The visits are scheduled seasonally; the spring visit aims to clean up after winter loads that may include salts and sands. The fall visit helps the system by removing excessive leaf litter. C. Each Included Maintenance visit consists of the following tasks. 1. Filterra® unit inspection 2. Foreign debris, silt, mulch & trash removal 3. Filter media evaluation and recharge as necessary 4. Plant health evaluation and pruning or replacement as necessary 5. Replacement of mulch 6. Disposal of all maintenance refuse items 7. Maintenance records updated and stored (reports available upon request) D. The beginning and ending date of Supplier's obligation to maintain the installed system shall be determined by the Supplier at the time the system is activated. Owners must promptly notify the Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology.	As recommended.
Hydromod/LID/Treatment BMP # 3 Proposed Bio-filtration swale / depressed landscape (BIO)	**Maintenance Considerations** Properly designed and installed bioretention cells require some regular maintenance, most frequently during the first year or two of establishment. Bioretention cells will require supplemental irrigation during the first 2-3 years after planting. Drought-tolerant species may need little additional water after this period, except during prolonged drought, when supplemental irrigation may become necessary for plant survival. Verify that the maintenance plan includes a watering schedule for the establishment period and in times of extreme drought after plants have been established. While vegetation is being established, remove weeds by hand (weeding frequency should decrease over time, as plants grow). Although plants may need occasional pruning or trimming, bioretention cells should generally not be mowed on a regular basis. Trim vegetation as necessary to maintain healthy plant growth. In some instances, where it is desired to maintain fast-growing, annual herbaceous plant cover, annual mowing may be appropriate. Replace dead plants. If a particular species proves to be prone to mortality, it may need to be replaced with a different species that is more likely to succeed on this particular site. Mulch should be re-applied when erosion is evident. In areas expected to have low metal loads in the runoff, mulch as needed to maintain a 2-3 inch depth. In areas with relatively high metal loads, replace mulch once per year. Bioretention cells should be inspected at least two times per year for sediment buildup, trash removal, erosion, and to evaluate the health of the vegetation. If sediment buildup reaches 25 percent of the ponding depth, it should be removed, taking care to minimize soil disturbance. If erosion is noticed within the bioretention cell, additional soil stabilization measures should be applied. If vegetation appears to be in poor health with no obvious cause, a landscape specialist should be consulted.	As recommended.
Hydromod/LID/Treatment BMP # 4 Proposed Proprietary Filtration, such as CDS Systems	**Maintenance** The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g., unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.	As recommended.
Hydromod/LID/Treatment BMP # 5 Proposed Underground Detention Basin (HU-2)		As recommended.

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MASTER PLAN HYDROLOGY REPORT

PREPARED FOR:

SOUTH SHORES CHURCH
CITY OF DANA POINT

PREPARED BY:

ADAMS • STREETER
CIVIL ENGINEERS, INC.
15 Corporate Park, Irvine, CA 92606
Ph:949-474-2330 Fax:949-474-0251

DATE PREPARED:

February 29, 2012

TABLE OF CONTENTS

I. INTRODUCTION

The proposed project involves the redevelopment of the existing South Shores Church site that spans an area of approximately 6 acres which consists primarily of a parking lot area and four (4) buildings including an existing preschool, administration / fellowship hall, chapel, and sanctuary. The property is located in the area north of the Pacific Coast Highway (PCH) on Crown Valley Parkway in the City of Dana Point with a site address of 32712 Crown Valley Parkway.

The redevelopment will be performed in phases to replace the older preschool, administration, and chapel buildings. The sanctuary building will be maintained on the site. A parking structure, which a part of is subterranean, is also proposed as part of the redevelopment to accommodate projected parking demands.

II. REPORT SCOPE

The purpose of this report is to establish both existing and post development peak flows of the site through hydrologic analysis and to identify potential issues and associated mitigations in regards to storm run-offs and water quality, as part of the Conditional Use Permit (CUP) phase of the project. Since the site will be constructed in phases, it is necessary within this report to convey the extreme (or site build-out) conditions as indicated herein. Any phased storm drain construction within the confines of the site shall be addressed during the permitting of each phase with a separate grading plan and amendments to this preliminary hydrology. Further refinements of the discharge rates will be visited at each phase of the design but the objective to limit potential post development off-site peak discharge to existing values as established herein shall be maintained.

It should be noted that a hydrology study by Norris Repke dated February 23, 2007 was initially prepared for this project. However, subsequent revisions of the hydrology study shall be performed by Adams-Streeter Civil Engineers, Inc.

III. METHODOLOGY

The hydrology calculations were performed in accordance with the requirements of the Orange County Hydrology Manual. The rational method calculations were developed utilizing Advanced Engineering Software (AES). The 25-year frequency and 100-year frequency storm calculations are located in the Appendix. The project site has soil with hydrologic classifications of principally Type "D".

IV. EXISTING CONDITIONS

The existing site of approximately 6.0 acres has been previously developed and is currently occupied by a preschool, administration / fellowship hall, chapel, sanctuary building with supporting surface parking facilities. There is permanent landscaping throughout the site consisting of trees and shrubs including native type vegetation along the man-made and natural slopes that bound the site along the easterly property boundary. The watershed is classified as a non-mountainous area. The slope of the existing site terrain is substantially uniform with the existing parking lot sloping at approximately 2.5% to 4%. The terrain behind the existing buildings on the easterly edge slopes at approximately 3 (horizontal) to 1 (vertical) and generally comprises of shrubbery and trees.

The parking lot sheet flows in a south-easterly direction to a single catch basin that intercepts and conveys surface flows to an on-site underground storm drain which outlets onto an off-site man-made open channel that almost immediately drains into an outlet structure. Both the off-site channel and outlet structure are located adjacent to the south-easterly corner of the property. Other portions of the site also drain to the parking lot and follow the same path to the existing outlet structure. The remainder portions of the site drain towards the existing slopes along the easterly and northeasterly edge of the site. The drainage patterns as described are illustrated on the Existing Drainage Area Exhibit and the Existing Condition Hydrology Map included in the Appendix.

The existing outlet structure was originally constructed in the early 1990's as a temporary retarding basin. The original intention was that this temporary facility would be removed and storm drain facilities would be extended as a part of a proposed housing development. However, the housing development did not occur and the area adjacent to the outlet structure is now an open-space area which will not be developed.
The outlet structure is a shallow basin formed by low earthen berms with outlet pipes. A small volume of water is periodically retained within the outlet structure basin but only for short durations due to discharge through the outlet drains and the action of percolation and evaporation. There is an existing perforated pipe riser within the basin of the outlet structure that meters flows to an existing concrete "v-ditch". Only flows up to the rates of low frequency storms are delivered to the "v-ditch" because of the small diameter of the riser and limited head available to deliver flows to the ditch. The "v-ditch" carries flows in a southerly direction and also collects flows from the housing project to the south of the Church. An overflow pipe embedded in the berm of the outlet structure also provides for any potential overflow to be discharged to grade during higher frequency storms. There are signs of limited erosion along the open space path of this flow.

The outlet structure accepts drainage from the church property and has been serving as an erosion control measure which dissipates the energy of high velocity flows resulting from the upstream on-site underground pipe that runs down a 3:1 slope.

The Church has a recorded easement that encompasses the outlet structure and has been periodically cleaning the outlet structure to minimize vegetation overgrowth and to remove

refuse deposits. A copy of the recorded easement agreement is in the appendix of this report.

The temporary basin was designed to decrease peak flows coming from the property to the original flows that occurred before the construction of the main sanctuary building. These original flows were calculated in the Hydrology and Hydraulic Report for South Shores Baptist Church, prepared by David A. Boyle Engineering on January 10, 1991. The hydrology report calculated that the 100-year peak flow being discharged by the property and outletting at the south-east corner was equal to 12.33 cfs. This accounted for approximately 3.2 acres of the property's total 6.0 acres. The report also included calculations that proved the existing concrete v-ditch, which is the ultimate conveyance structure, was able to meet capacity. See Appendix for original calculations prepared by Boyle Engineering.

After the sanctuary building was constructed, the property's peak discharge increased. These peak discharge numbers have been calculated in this report and are referred to as "Existing Conditions". While the peak flows calculated for the existing conditions are larger than the original flows calculated by Boyle Engineering, the temporary basins acted as a detention basin which reduced the discharge to the existing v-ditch.

The original design of the basin included three in-line basins with outlet pipes as described above. Since the construction of the church sanctuary, 2 of the 3 basins no longer exist. While no significant signs of overflow or erosion can be seen, it is assumed that the remaining basin is undersized and will not be able to handle the needed capacity for larger storm events. For this reason, it is the intent of this report to eliminate the basin and replicate pre-existing flows as calculated by the Boyle Engineering Hydrology Report.

V. PROPOSED CONDITIONS

In its ultimate condition the project will be developed as shown on the Proposed Master Site Plan (Architectural Plan A3.0) which is included in the Appendix. The majority of the proposed site, Area "A", is comprised of approximately 4.0 acres. To reduce peak flows, flows from Area "A" will enter a proposed underground detention system. This underground detention system will be comprised of two 84" pipes with a restrictor plate at its outlet. The location of the underground detention system is shown on the Developed Condition Hydrology Map. This proposed storm drain will continue to collect flows from Area "B" downstream of the detention system before discharging to the existing concrete v-ditch at the property's south-east corner. A discharge head wall and v-ditch connection will have to be constructed to properly convey flows from Areas "A", "B", and "C" to the existing v-ditch.

The proposed underground temporary-detention basin will reduce the site's developed peak flow to match existing flows as calculated by the Boyle Engineering Hydrology report. The balance of the site that does not enter the storm drain system, shown as Area "D" is considered natural slope. These peak flows are reduced substantially, as shown in Table A-1. Area "E", comprised of driveways, sidewalk and parkway, sheet flows towards Crown Valley

Parkway and is also reduced from existing conditions. A copy of the Developed Condition Hydrology Map that shows the concept drainage system is included in the Appendix.

TABLE A-1

LOCATION	AREAS		25-YEAR PEAK FLOW		100-YEAR PEAK FLOW	
	EXISTING (ACRES)	DEVELOPED (ACRES)	EXISTING (CFS)	DEVELOPED (CFS)	EXISTING (CFS)	DEVELOPED (CFS)
"A", "B", & "C"	3.2	5.2	13.1 / 9.6*	8.9	16.8 / 12.3*	10.0
"D"	2.4	0.7	11.3	2.8	14.3	3.6
"E"	0.4	0.1	1.7	0.4	2.1	0.6

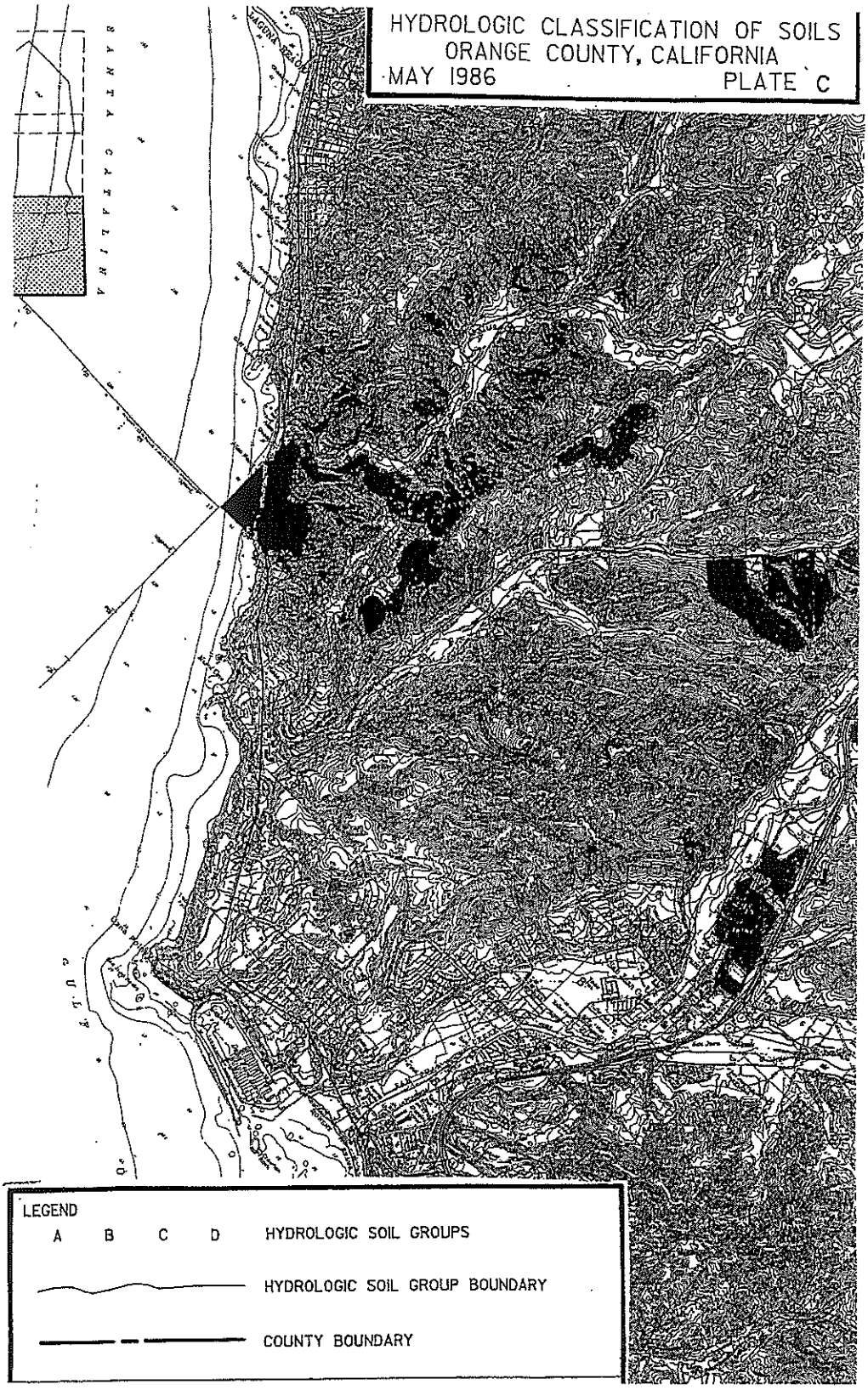
Flows refer to existing peak flows as calculated by the Hydrology Report prepared by Boyle Engineering.

The Drainage Area Exhibits in Section VIII show the relationship between the existing and developed conditions. The amount of flows being re-directed away from the slope at the north-easterly property is significant and should be considered beneficial to the slope stability of that area. While the acreage increases for Area "A", "B", & "C" in the developed condition, the proposed on-site detention system significantly reduces the site's peak flow.

Table A-1 above shows the 25-year and 100-year storm event peak flows for the existing and post development conditions. As indicated, the proposed post development peak discharge along the northerly and easterly slopes are less than the existing condition rates. Also, the proposed post development peak discharge at the south-east corner is less than the existing condition rates as calculated by the church's original hydrology report prepared by Boyle Engineering.

VI. VICINITY MAP

VII. SOIL GROUP MAP


HYDROLOGIC CLASSIFICATION OF SOILS
ORANGE COUNTY, CALIFORNIA
MAY 1986
PLATE C
SANTA ANA
LAGUNA
LEGEND
A B C D
HYDROLOGIC SOIL GROUPS
HYDROLOGIC SOIL GROUP BOUNDARY
COUNTY BOUNDARY

VIII. DRAINAGE AREA EXHIBITS

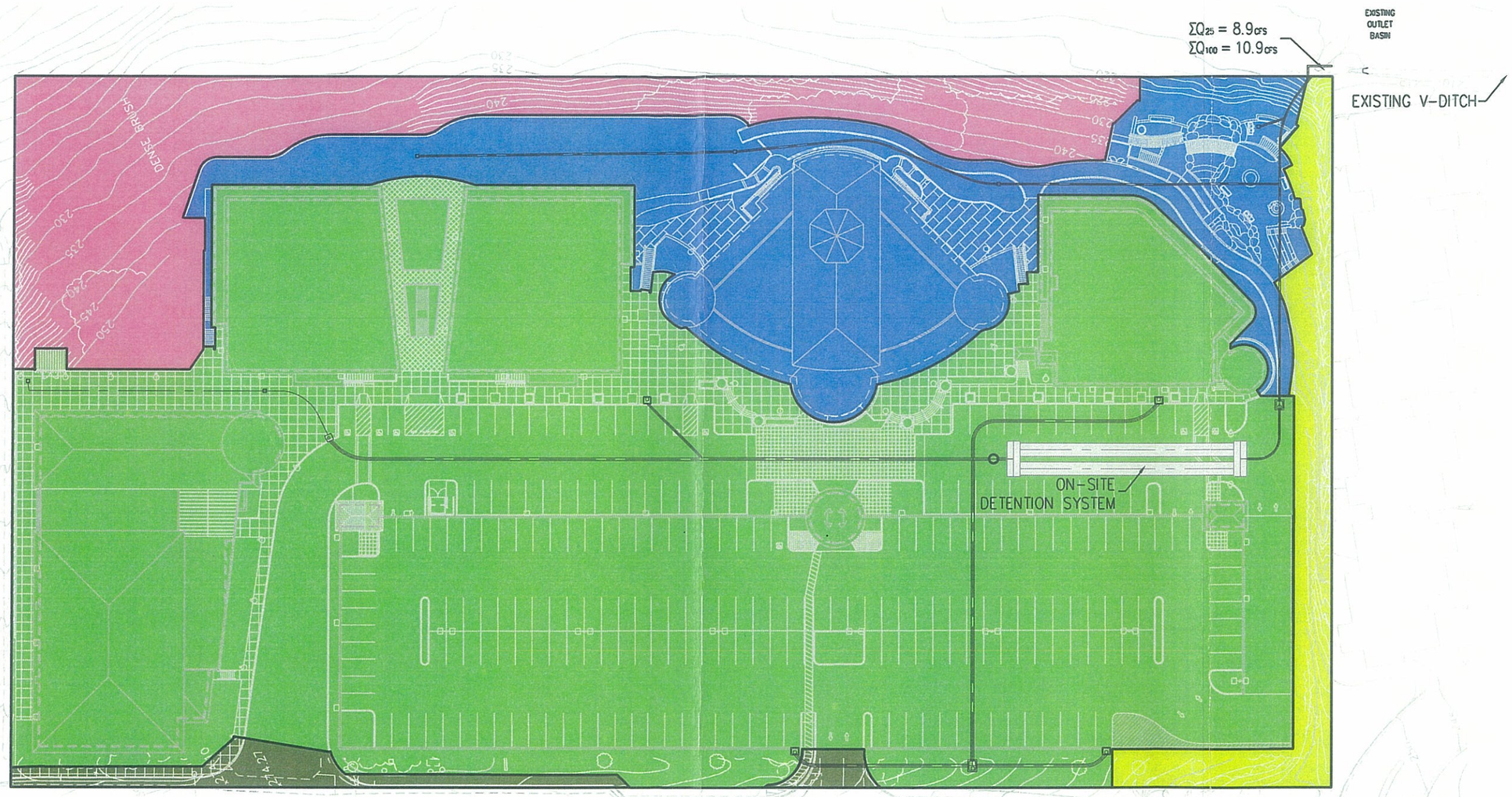
- **Existing Condition**
- **Developed Condition**

1" = 60'

DRAINAGE AREA EXHIBIT

EXISTING CONDITION

AREA	ACREAGE	Q_{25}	ΣQ_{25}	Q_{100}	ΣQ_{100}
AREA "A"	2.1 ACRES	9.2 CFS	13.1 CFS	11.8 CFS	16.8 CFS
AREA "B"	0.8 ACRES	2.9 CFS		3.8 CFS	
AREA "C"	0.3 ACRES	1.2 CFS		1.6 CFS	
AREA "D"	2.4 ACRES	11.3 CFS	11.3 CFS	14.3 CFS	14.3 CFS
AREA "E"	0.4 ACRES	1.7 CFS	1.7 CFS	2.1 CFS	2.1 CFS
TOTAL	6.0 ACRES				



1" =60'

DRAINAGE AREA EXHIBIT

DEVELOPED CONDITION

AREA	ACREAGE	Q_{25}	ΣQ_{25}	Q_{100}	ΣQ_{100}
AREA "A"	4.0 ACRES	5.8* CFS		6.8* CFS	
AREA "B"	1.0 ACRES	2.9 CFS	8.9 CFS	3.7 CFS	10.9 CFS
AREA "C"	0.2 ACRES	0.7 CFS		1.0 CFS	
AREA "D"	0.7 ACRES	2.8 CFS	2.8 CFS	3.6 CFS	3.6 CFS
AREA "E"	0.1 ACRES	0.4 CFS	0.4 CFS	0.6 CFS	0.6 CFS
TOTAL	6.0 ACRES				

*INCLUDES FLOW REDUCTION DUE TO ON-SITE DETENTION SYSTEM

IX. 25-YEAR HYDROLOGY CALCULATIONS

- **Existing 25-Year**
- **Developed 25-Year**

```
**************************************************************************
              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
          (c) Copyright 1983-2002 Advanced Engineering Software (aes)
              Ver. 8.0  Release Date: 01/01/2002  License ID 1204

                              Analysis prepared by:

                        Adams-Streeter Civil Engineers, Inc.
                                15 Corporate Park
                                 Irvine, CA 92606
                                   949-474-2330

 ************************** DESCRIPTION OF STUDY **************************
* Q25 STORM EVENT                                                        *
* SOUTH SHORES CHURCH                                                    *
* EXISTING CONDITIONS                                                    *
 **************************************************************************

  FILE NAME: CHURCHEX.DAT
  TIME/DATE OF STUDY: 16:57 08/10/2007
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ======  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 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    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    78.00
  ELEVATION DATA: UPSTREAM(FEET) =    274.60  DOWNSTREAM(FEET) =    274.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.757
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.068
```

```
 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.)
 SCHOOL                      D        0.20      0.20       0.60    75    6.76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.60
 SUBAREA RUNOFF(CFS) =      0.71
 TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.71

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   272.20  DOWNSTREAM(FEET) =   264.50
 FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.83
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =   4.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.71
 PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =   7.12
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =   204.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   7.12
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.982
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        D        0.27      0.20       0.50    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.50
 SUBAREA AREA(ACRES) =     0.27      SUBAREA RUNOFF(CFS) =     0.94
 EFFECTIVE AREA(ACRES) =     0.47   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.54
 TOTAL AREA(ACRES) =     0.47       PEAK FLOW RATE(CFS) =       1.64

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    264.50  DOWNSTREAM(FEET) =    237.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   115.80   CHANNEL SLOPE =  0.2375
 CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.922
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
```

```
".4 DWELLING/ACRE"          D        0.12      0.20      0.90     75
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.84
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.84
AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   0.15
Tc(MIN.) =   7.27
SUBAREA AREA(ACRES) =    0.12       SUBAREA RUNOFF(CFS) =    0.40
EFFECTIVE AREA(ACRES) =    0.59     AREA-AVERAGED Fm(INCH/HR) =   0.12
AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.62
TOTAL AREA(ACRES) =    0.59         PEAK FLOW RATE(CFS) =       2.02

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.39   FLOW VELOCITY(FEET/SEC.) =  13.00
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =   319.80 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =    237.00  DOWNSTREAM(FEET) =    227.50
CHANNEL LENGTH THRU SUBAREA(FEET) =    34.00   CHANNEL SLOPE =  0.2794
CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.000
MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
CHANNEL FLOW THRU SUBAREA(CFS) =      2.02
FLOW VELOCITY(FEET/SEC.) =  13.66   FLOW DEPTH(FEET) =   0.38
TRAVEL TIME(MIN.) =   0.04   Tc(MIN.) =   7.31
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =   353.80 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  10
----------------------------------------------------------------------------
>>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
INITIAL SUBAREA FLOW-LENGTH(FEET) =    31.50
ELEVATION DATA: UPSTREAM(FEET) =    265.30  DOWNSTREAM(FEET) =    265.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
*  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
SUBAREA Tc AND LOSS RATE DATA(AMC  II):
 DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
APARTMENTS                 D       0.07      0.20       0.20     75    5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.20
SUBAREA RUNOFF(CFS) =      0.30
TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.30

****************************************************************************
FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  41
```

```
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   263.00  DOWNSTREAM(FEET) =   262.50
 FLOW LENGTH(FEET) =    24.90   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.34
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =   4.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.30
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   5.12
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    56.40 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    104.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   102.10
 ELEVATION DATA: UPSTREAM(FEET) =    262.50  DOWNSTREAM(FEET) =    227.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.11      0.20       0.90    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.11   INITIAL SUBAREA RUNOFF(CFS) =    0.46

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.12
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.771
 SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.45
 EFFECTIVE AREA(ACRES) =     0.18   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =     0.18       PEAK FLOW RATE(CFS) =       0.75

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1       0.75   5.12     4.771  0.20( 0.13) 0.63     0.2      110.00
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    104.00 =    56.40 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1       2.02   7.31     3.906  0.20( 0.12) 0.62     0.6      100.00
```

```
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =   353.80 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM     Q      Tc    Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER   (CFS)  (MIN.)  (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      2.49   5.12     4.771  0.20( 0.12) 0.62      0.6      110.00
     2      2.63   7.31     3.906  0.20( 0.12) 0.62      0.8      100.00
   TOTAL AREA(ACRES) =      0.77

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        2.63  Tc(MIN.) =    7.309
 EFFECTIVE AREA(ACRES) =      0.77  AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =      0.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =   353.80 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.70
 ELEVATION DATA: UPSTREAM(FEET) =    265.30  DOWNSTREAM(FEET) =    264.60

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                  D        0.06      0.20       0.20    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.20
 SUBAREA RUNOFF(CFS) =      0.26
 TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.26

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   171.20
 ELEVATION DATA: UPSTREAM(FEET) =    264.60  DOWNSTREAM(FEET) =    190.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.39      0.20       0.90    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.39   INITIAL SUBAREA RUNOFF(CFS) =    1.63

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.00
```

```
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA AREA(ACRES) =     0.39      SUBAREA RUNOFF(CFS) =     1.63
 EFFECTIVE AREA(ACRES) =     0.45   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.81
 TOTAL AREA(ACRES) =     0.45       PEAK FLOW RATE(CFS) =       1.89

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    68.00
 ELEVATION DATA: UPSTREAM(FEET) =    274.30  DOWNSTREAM(FEET) =    264.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      D        0.09      0.20       0.40     75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.40
 SUBAREA RUNOFF(CFS) =      0.38
 TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.38

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   262.50  DOWNSTREAM(FEET) =   254.50
 FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.76
 GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.38
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   5.12
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =   126.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.12
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.771
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.09      0.20       0.90     75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.09      SUBAREA RUNOFF(CFS) =     0.37
 EFFECTIVE AREA(ACRES) =     0.18   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.65
```

```
 TOTAL AREA(ACRES) =     0.18       PEAK FLOW RATE(CFS) =       0.75

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    97.00
 ELEVATION DATA: UPSTREAM(FEET) =    254.50  DOWNSTREAM(FEET) =    225.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.18      0.20       0.90    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.18   INITIAL SUBAREA RUNOFF(CFS) =    0.75

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.12
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.771
 SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.74
 EFFECTIVE AREA(ACRES) =     0.36   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.78
 TOTAL AREA(ACRES) =     0.36       PEAK FLOW RATE(CFS) =       1.50

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    67.00
 ELEVATION DATA: UPSTREAM(FEET) =    265.50  DOWNSTREAM(FEET) =    264.70

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.070
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.792
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        D        0.09      0.20       0.50    75    5.07
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.50
 SUBAREA RUNOFF(CFS) =      0.38
 TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.38

****************************************************************************
 FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   262.70  DOWNSTREAM(FEET) =   254.50
```

```
 FLOW LENGTH(FEET) =    88.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.77
 GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.38
 PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =   5.29
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =   155.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    143.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.50
 ELEVATION DATA: UPSTREAM(FEET) =    254.50  DOWNSTREAM(FEET) =    235.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.17      0.20       0.90    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.17   INITIAL SUBAREA RUNOFF(CFS) =    0.71

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.29
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.706
 SUBAREA AREA(ACRES) =    0.17      SUBAREA RUNOFF(CFS) =    0.69
 EFFECTIVE AREA(ACRES) =     0.26   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =     0.26       PEAK FLOW RATE(CFS) =       1.07

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   132.00
 ELEVATION DATA: UPSTREAM(FEET) =    265.00  DOWNSTREAM(FEET) =    235.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.21      0.20       0.90    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA RUNOFF(CFS) =      0.88
 TOTAL AREA(ACRES) =      0.21   PEAK FLOW RATE(CFS) =      0.88

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

```
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    87.50
 ELEVATION DATA: UPSTREAM(FEET) =    251.00  DOWNSTREAM(FEET) =    216.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.32      0.20       0.90    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA RUNOFF(CFS) =      1.34
 TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      1.34

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   172.00
 ELEVATION DATA: UPSTREAM(FEET) =    265.80  DOWNSTREAM(FEET) =    251.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 CONDOMINIUMS                D        0.19      0.20       0.35    75    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.35
 SUBAREA RUNOFF(CFS) =      0.81
 TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.81

****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    301.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =    5.00
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.11      0.20       0.10    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =     0.11      SUBAREA RUNOFF(CFS) =     0.48
 EFFECTIVE AREA(ACRES) =     0.30    AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20   AREA-AVERAGED Ap =  0.26
 TOTAL AREA(ACRES) =      0.30       PEAK FLOW RATE(CFS) =       1.29
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   249.00  DOWNSTREAM(FEET) =   247.00
 FLOW LENGTH(FEET) =   101.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.14
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      1.29
 PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   5.33
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =   273.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.33
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.690
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.12      0.20       0.10    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    0.50
 EFFECTIVE AREA(ACRES) =     0.42   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.21
 TOTAL AREA(ACRES) =     0.42       PEAK FLOW RATE(CFS) =       1.76

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   247.00  DOWNSTREAM(FEET) =   245.00
 FLOW LENGTH(FEET) =   101.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.59
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      1.76
 PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   5.63
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =   374.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   141.00
 ELEVATION DATA: UPSTREAM(FEET) =    252.50  DOWNSTREAM(FEET) =    249.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.489
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.834
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "1 DWELLING/ACRE"          D        0.23      0.20       0.80     75    7.49
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.80
 SUBAREA RUNOFF(CFS) =      0.76
 TOTAL AREA(ACRES) =      0.23   PEAK FLOW RATE(CFS) =      0.76

****************************************************************************
 FLOW PROCESS FROM NODE    311.00 TO NODE    311.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   7.49
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.834
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.11      0.20       0.10     75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =     0.11      SUBAREA RUNOFF(CFS) =     0.38
 EFFECTIVE AREA(ACRES) =     0.34    AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =     0.34       PEAK FLOW RATE(CFS) =      1.14

****************************************************************************
 FLOW PROCESS FROM NODE    311.00 TO NODE    303.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   247.80  DOWNSTREAM(FEET) =   245.00
 FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.45
 GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      1.14
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   7.53
 LONGEST FLOWPATH FROM NODE    310.00 TO NODE    303.00 =   167.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM     Q      Tc    Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER   (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)         (ACRES)     NODE
    1      1.14    7.53     3.822   0.20( 0.11) 0.57     0.3      310.00
 LONGEST FLOWPATH FROM NODE    310.00 TO NODE    303.00 =   167.00 FEET.
```

```
 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM      Q      Tc    Intensity    Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)          (ACRES)     NODE
     1       1.76    5.63     4.570  0.20( 0.04) 0.21      0.4      300.00
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =   374.50 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc    Intensity    Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)          (ACRES)     NODE
     1       2.78    5.63     4.570  0.20( 0.07) 0.35      0.7      300.00
     2       2.60    7.53     3.822  0.20( 0.07) 0.37      0.8      310.00
   TOTAL AREA(ACRES) =      0.76

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        2.78  Tc(MIN.) =    5.630
 EFFECTIVE AREA(ACRES) =      0.67  AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.37
 TOTAL AREA(ACRES) =      0.76
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =   374.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    403.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   245.00  DOWNSTREAM(FEET) =   225.70
 FLOW LENGTH(FEET) =    81.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  15.62
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      2.78
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   5.72
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    403.00 =   455.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.72
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.536
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.05      0.20       0.90    75
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.05      SUBAREA RUNOFF(CFS) =     0.20
 EFFECTIVE AREA(ACRES) =     0.72    AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.39
 TOTAL AREA(ACRES) =      0.81      PEAK FLOW RATE(CFS) =       2.91

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    62.00
  ELEVATION DATA: UPSTREAM(FEET) =    275.20  DOWNSTREAM(FEET) =    273.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
  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        0.10      0.20       0.10    75    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  82
----------------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   509.00
  ELEVATION DATA: UPSTREAM(FEET) =    273.00  DOWNSTREAM(FEET) =    250.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.862
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.083
  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        2.03      0.20       0.10    75    6.86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
  SUBAREA AREA(ACRES) =    2.03   INITIAL SUBAREA RUNOFF(CFS) =    7.42

  ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
  MAINLINE Tc(MIN) =   5.00
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
  SUBAREA AREA(ACRES) =    2.03      SUBAREA RUNOFF(CFS) =    8.77
  EFFECTIVE AREA(ACRES) =     2.13   AREA-AVERAGED Fm(INCH/HR) =  0.02
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =     2.13       PEAK FLOW RATE(CFS) =       9.20

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   243.60  DOWNSTREAM(FEET) =   225.70
  FLOW LENGTH(FEET) =   123.30   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.82
```

```
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      9.20
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   5.12
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =   185.30 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR)  (INCH/HR)         (ACRES)     NODE
     1       9.20   5.12    4.774  0.20( 0.02) 0.10      2.1      400.00
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =   185.30 FEET.

 ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR)  (INCH/HR)         (ACRES)     NODE
     1       2.91   5.72    4.536  0.20( 0.08) 0.39      0.7      300.00
     2       2.71   7.62    3.802  0.20( 0.08) 0.41      0.8      310.00
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    403.00 =   455.50 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR)  (INCH/HR)         (ACRES)     NODE
     1      11.94   5.12    4.774  0.20( 0.03) 0.17      2.8      400.00
     2      11.65   5.72    4.536  0.20( 0.03) 0.17      2.9      300.00
     3      10.03   7.62    3.802  0.20( 0.04) 0.18      2.9      310.00
   TOTAL AREA(ACRES) =      2.94

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.94  Tc(MIN.) =    5.115
 EFFECTIVE AREA(ACRES) =     2.78  AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
 TOTAL AREA(ACRES) =      2.94
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    403.00 =   455.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   225.70  DOWNSTREAM(FEET) =   209.30
 FLOW LENGTH(FEET) =    79.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  21.66
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     11.94
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   5.18
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    404.00 =   534.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    404.00 TO NODE    502.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   211.00  DOWNSTREAM(FEET) =   210.50
 FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.96
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     11.94
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   5.19
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    502.00 =   544.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   143.00
 ELEVATION DATA: UPSTREAM(FEET) =    263.50  DOWNSTREAM(FEET) =    252.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.869
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.476
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.07      0.20       0.90    75    5.87
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA RUNOFF(CFS) =      0.27
 TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.27

****************************************************************************
 FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   336.00
 ELEVATION DATA: UPSTREAM(FEET) =    252.00  DOWNSTREAM(FEET) =    210.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.581
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.812
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.24      0.20      0.90     75     7.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.24   INITIAL SUBAREA RUNOFF(CFS) =     0.78

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.87
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.476
 SUBAREA AREA(ACRES) =     0.24      SUBAREA RUNOFF(CFS) =     0.93
 EFFECTIVE AREA(ACRES) =     0.31   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
 TOTAL AREA(ACRES) =     0.31       PEAK FLOW RATE(CFS) =       1.20

****************************************************************************
 FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       1.20   5.87    4.476  0.20( 0.18) 0.90      0.3      500.00
 LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =   143.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      11.94   5.19    4.744  0.20( 0.03) 0.17      2.8      400.00
     2      11.65   5.79    4.506  0.20( 0.03) 0.17      2.9      300.00
     3      10.03   7.70    3.784  0.20( 0.04) 0.18      2.9      310.00
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    502.00 =   544.50 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      13.07   5.19    4.744  0.20( 0.05) 0.23      3.1      400.00
     2      12.84   5.79    4.506  0.20( 0.05) 0.24      3.2      300.00
     3      12.78   5.87    4.476  0.20( 0.05) 0.24      3.2      500.00
     4      11.04   7.70    3.784  0.20( 0.05) 0.25      3.2      310.00
   TOTAL AREA(ACRES) =      3.25

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      13.07  Tc(MIN.) =    5.191
 EFFECTIVE AREA(ACRES) =     3.05  AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.24
 TOTAL AREA(ACRES) =     3.25
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    502.00 =   544.50 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =     3.25  TC(MIN.) =      5.19
 EFFECTIVE AREA(ACRES) =     3.05  AREA-AVERAGED Fm(INCH/HR)=  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.23
 PEAK FLOW RATE(CFS)    =    13.07

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      13.07   5.19    4.744  0.20( 0.05) 0.23      3.1      400.00
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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            Ver. 15.0  Release Date: 04/01/2008  License ID 1204

                          Analysis prepared by:

                    Adams-Streeter Civil Engineers, Inc.
                            15 Corporate Park
                             Irvine, CA 92606
                               949-474-2330

 ************************* DESCRIPTION OF STUDY *************************
* 25-YEAR FREQUENCY                                                      *
* AREAS A, B, AND C                                                      *
* SOUTH SHORES CHURCH, DANA POINT                                        *
 ************************************************************************

  FILE NAME: SSC-A-B.DAT
  TIME/DATE OF STUDY: 10:18 02/13/2012
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ======= ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 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

+------------------------------------------------------------------------+
| AREA - A                                                               |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
 ELEVATION DATA: UPSTREAM(FEET) =    274.00  DOWNSTREAM(FEET) =    265.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.250
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.692
 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        0.06      0.20      0.100    75    5.25
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.25
 TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.25

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   263.00  DOWNSTREAM(FEET) =   261.00
 FLOW LENGTH(FEET) =   127.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.03
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.25
 PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =    5.95
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     367.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.95
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.372
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.44      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) =    0.44      SUBAREA RUNOFF(CFS) =    1.72
 EFFECTIVE AREA(ACRES) =      0.50   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       0.5       PEAK FLOW RATE(CFS) =       1.96

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.95
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.372
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.12      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) =     0.12      SUBAREA RUNOFF(CFS) =     0.47
 EFFECTIVE AREA(ACRES) =      0.62   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.6       PEAK FLOW RATE(CFS) =       2.43

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   261.00  DOWNSTREAM(FEET) =   259.50
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.54
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.43
 PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =    6.05
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     412.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.05
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.331
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.05      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) =     0.05      SUBAREA RUNOFF(CFS) =     0.19
 EFFECTIVE AREA(ACRES) =      0.67   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.7       PEAK FLOW RATE(CFS) =       2.60

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   166.00
 ELEVATION DATA: UPSTREAM(FEET) =    275.50  DOWNSTREAM(FEET) =    265.50

 Tc = 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/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  D        0.16      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 AREA(ACRES) =     0.16   INITIAL SUBAREA RUNOFF(CFS) =     0.69

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
```

```
 MAINLINE Tc(MIN.) =    6.05
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.331
 SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.62
 EFFECTIVE AREA(ACRES) =      0.83   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       3.22

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   259.50  DOWNSTREAM(FEET) =   259.00
 FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.06
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.22
 PIPE TRAVEL TIME(MIN.) =   1.09    Tc(MIN.) =    7.14
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     612.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.14
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.943
 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
 COMMERCIAL                D        0.25      0.20      0.100    75
 COMMERCIAL                D        0.41      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) =    0.92      SUBAREA RUNOFF(CFS) =    3.25
 EFFECTIVE AREA(ACRES) =      1.75   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.8       PEAK FLOW RATE(CFS) =       6.18

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   259.00  DOWNSTREAM(FEET) =   248.50
 FLOW LENGTH(FEET) =   143.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.64
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.18
 PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    7.33
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     755.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  10
----------------------------------------------------------------------------
```

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

********************************************************************************
  FLOW PROCESS FROM NODE     200.00 TO NODE     201.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   247.00
  ELEVATION DATA: UPSTREAM(FEET) =    277.50  DOWNSTREAM(FEET) =    269.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.403
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.617
  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        0.50      0.20      0.100    75    5.40
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.07
  TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      2.07

********************************************************************************
  FLOW PROCESS FROM NODE     201.00 TO NODE     202.00 IS CODE =  41
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   263.00  DOWNSTREAM(FEET) =   255.00
  FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.61
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.07
  PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =    5.57
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     343.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     202.00 TO NODE     202.00 IS CODE =  10
--------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
================================================================================

********************************************************************************
  FLOW PROCESS FROM NODE     203.00 TO NODE     204.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   376.00
  ELEVATION DATA: UPSTREAM(FEET) =    277.50  DOWNSTREAM(FEET) =    264.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.338
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.218
  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        0.99      0.20      0.100     75     6.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.74
 TOTAL AREA(ACRES) =      0.99   PEAK FLOW RATE(CFS) =      3.74

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    202.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   257.00  DOWNSTREAM(FEET) =   255.00
 FLOW LENGTH(FEET) =    72.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.73
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.74
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    6.49
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    202.00 =     448.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        3.74    6.49    4.161  0.20( 0.02) 0.10        1.0      203.00
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    202.00 =     448.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        2.07    5.57    4.538  0.20( 0.02) 0.10        0.5      200.00
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     343.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        5.57    5.57    4.538  0.20( 0.02) 0.10        1.3      200.00
    2        5.64    6.49    4.161  0.20( 0.02) 0.10        1.5      203.00
   TOTAL AREA(ACRES) =        1.5

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.64  Tc(MIN.) =    6.493
 EFFECTIVE AREA(ACRES) =     1.49  AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       1.5
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    202.00 =     448.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   250.00  DOWNSTREAM(FEET) =   248.50
```

```
 FLOW LENGTH(FEET) =   162.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.76
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.64
 PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =    6.96
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    105.00 =     610.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        5.57    6.04    4.335  0.20( 0.02) 0.10       1.3      200.00
     2        5.64    6.96    4.000  0.20( 0.02) 0.10       1.5      203.00
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    105.00 =     610.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        6.18    7.33    3.885  0.20( 0.02) 0.10       1.8      100.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     755.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap     Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       11.25    6.04    4.335  0.20( 0.02) 0.10       2.8      200.00
     2       11.68    6.96    4.000  0.20( 0.02) 0.10       3.2      203.00
     3       11.65    7.33    3.885  0.20( 0.02) 0.10       3.2      100.00
   TOTAL AREA(ACRES) =        3.2

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.68  Tc(MIN.) =    6.961
 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
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     755.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.96
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.000
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.56      0.20      0.100    75
 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) =    0.79      SUBAREA RUNOFF(CFS) =    2.83
 EFFECTIVE AREA(ACRES) =     3.94   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       4.0       PEAK FLOW RATE(CFS) =      14.12
```

```
+----------------------------------------------------------------------------+
| ON-SITE DETENTION SYSTEM                                                   |
| PEAK FLOW REDUCTION FROM Q25=14.12 CFS TO Q25=5.75 CFS                     |
| MAXIMUM STORAGE VOLUME = 0.164 AC-FT                                       |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =    6.96   RAINFALL INTENSITY(INCH/HR) =  4.00
  EFFECTIVE AREA(ACRES) =     1.60
  TOTAL AREA(ACRES) =     4.00         PEAK FLOW RATE(CFS) =      5.75
  AREA-AVERAGED Fm(INCH/HR) =   0.02  AREA-AVERAGED Fp(INCH/HR) =   0.20
  AREA-AVERAGED Ap =  0.10
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   245.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =    47.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.32
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.75
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.07
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     802.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   225.00
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.78
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.75
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    7.19
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     922.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================
```

```
+----------------------------------------------------------------------+
| AREA - B                                                             |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
======================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   133.00
  ELEVATION DATA: UPSTREAM(FEET) =    250.00  DOWNSTREAM(FEET) =    248.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.619
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.544
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL  AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 D        0.07      0.20      0.850    75    8.62
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.21

**********************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  41
----------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
======================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   247.00  DOWNSTREAM(FEET) =   245.30
  FLOW LENGTH(FEET) =   168.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.48
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.21
  PIPE TRAVEL TIME(MIN.) =   1.13    Tc(MIN.) =    9.75
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     301.00 FEET.

**********************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  82
----------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
======================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   163.00
  ELEVATION DATA: UPSTREAM(FEET) =    250.00  DOWNSTREAM(FEET) =    248.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.969
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.705
  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.)
  SCHOOL                      D        0.23      0.20      0.600    75    7.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
```

```
 SUBAREA AREA(ACRES) =     0.23   INITIAL SUBAREA RUNOFF(CFS) =     0.74

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN.) =     9.75
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.305
 SUBAREA AREA(ACRES) =     0.23      SUBAREA RUNOFF(CFS) =     0.66
 EFFECTIVE AREA(ACRES) =      0.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.66
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       0.86

****************************************************************************
 FLOW PROCESS FROM NODE     402.00 TO NODE     402.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =     9.75
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.305
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.11      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) =     0.11      SUBAREA RUNOFF(CFS) =     0.33
 EFFECTIVE AREA(ACRES) =      0.41   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.51
 TOTAL AREA(ACRES) =        0.4       PEAK FLOW RATE(CFS) =       1.18

****************************************************************************
 FLOW PROCESS FROM NODE     402.00 TO NODE     403.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   245.30  DOWNSTREAM(FEET) =   243.80
 FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.05
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.18
 PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =   10.34
 LONGEST FLOWPATH FROM NODE     400.00 TO NODE     403.00 =     445.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     403.00 TO NODE     403.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   10.34
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.197
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.12      0.20      0.100    75
 COMMERCIAL                 D        0.11      0.20      0.100    75
 COMMERCIAL                 D        0.11      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) =     0.34      SUBAREA RUNOFF(CFS) =     0.97
 EFFECTIVE AREA(ACRES) =      0.75   AREA-AVERAGED Fm(INCH/HR) =  0.06
```

```
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.32
 TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       2.11

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    108.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   243.80  DOWNSTREAM(FEET) =   225.00
 FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  11.70
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.11
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =   10.56
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    108.00 =     595.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        2.11   10.56    3.160  0.20( 0.06) 0.32        0.8      400.00
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    108.00 =     595.00 FEET.

 ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        5.75    7.19    3.928  0.20( 0.02) 0.10        1.6      100.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     922.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
    1        7.55    7.19    3.928  0.20( 0.03) 0.15        2.1      100.00
    2        6.73   10.56    3.160  0.20( 0.03) 0.17        2.3      400.00
   TOTAL AREA(ACRES) =         4.8

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        7.55  Tc(MIN.) =    7.186
 EFFECTIVE AREA(ACRES) =      2.11  AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
 TOTAL AREA(ACRES) =        4.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     922.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   225.00  DOWNSTREAM(FEET) =   220.00
 FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.29
```

```
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        7.55
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.22
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     957.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.22
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.918
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.22      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) =    0.22      SUBAREA RUNOFF(CFS) =    0.77
 EFFECTIVE AREA(ACRES) =      2.33   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.15
 TOTAL AREA(ACRES) =         5.0       PEAK FLOW RATE(CFS) =       8.16

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   220.00  DOWNSTREAM(FEET) =   210.00
 FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  25.18
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        8.16
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    7.24
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     984.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| AREA - C                                                                 |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =    263.00  DOWNSTREAM(FEET) =    248.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.123
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.301
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                 D        0.08      0.20      0.850    75    6.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.08   PEAK FLOW RATE(CFS) =      0.30

********************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    110.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    248.00  DOWNSTREAM(FEET) =    210.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   292.00   CHANNEL SLOPE =  0.1301
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.046
  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
  "CHAPARRAL,BROADLEAF"       D        0.13      0.20      1.000    81
  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) =      0.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.97
  AVERAGE FLOW DEPTH(FEET) =   0.19   TRAVEL TIME(MIN.) =   0.70
  Tc(MIN.) =    6.82
  SUBAREA AREA(ACRES) =     0.13      SUBAREA RUNOFF(CFS) =    0.45
  EFFECTIVE AREA(ACRES) =     0.21     AREA-AVERAGED Fm(INCH/HR) =   0.19
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.94
  TOTAL AREA(ACRES) =       0.2         PEAK FLOW RATE(CFS) =      0.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   7.64
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    110.00 =     462.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  11
--------------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
================================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae      HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        0.73    6.82    4.046  0.20( 0.19) 0.94       0.2     500.00
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    110.00 =     462.00 FEET.
```

```
** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM        Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
    1         8.16    7.24    3.913  0.20( 0.03) 0.15        2.3      100.00
    2         7.22   10.61    3.151  0.20( 0.03) 0.17        2.6      400.00
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     984.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM        Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
    1         8.68    6.82    4.046  0.20( 0.04) 0.22        2.4      500.00
    2         8.86    7.24    3.913  0.20( 0.04) 0.21        2.5      100.00
    3         7.78   10.61    3.151  0.20( 0.04) 0.22        2.8      400.00
  TOTAL AREA(ACRES) =          5.2

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =        8.86  Tc(MIN.) =    7.238
EFFECTIVE AREA(ACRES) =      2.54  AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.21
TOTAL AREA(ACRES) =         5.2
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     984.00 FEET.
====================================================================

END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =         5.2  TC(MIN.) =      7.24
EFFECTIVE AREA(ACRES) =       2.54  AREA-AVERAGED Fm(INCH/HR)=  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.215
PEAK FLOW RATE(CFS)    =       8.86

** PEAK FLOW RATE TABLE **
 STREAM        Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER      (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
    1         8.68    6.82    4.046  0.20( 0.04) 0.22        2.4      500.00
    2         8.86    7.24    3.913  0.20( 0.04) 0.21        2.5      100.00
    3         7.78   10.61    3.151  0.20( 0.04) 0.22        2.8      400.00
====================================================================
====================================================================

END OF RATIONAL METHOD ANALYSIS
```

2	12.84	5.79	4.506	0.20(0.05)	0.24	3.2	300.00
3	12.78	5.87	4.476	0.20(0.05)	0.24	3.2	500.00
4	11.04	7.70	3.784	0.20(0.05)	0.25	3.2	310.00

END OF RATIONAL METHOD ANALYSIS

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

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Analysis prepared by:

Adams-Streeter Civil Engineers, Inc.
15 Corporate Park
Irvine, CA 92606
949-474-2330

```
 ************************* DESCRIPTION OF STUDY *************************
* PROPOSED CONDITION - AREA "D"                                         *
* 25-YEAR FREQUENCY STORM                                               *
* SOUTH SHORES CHURCH, DANA POINT, CA                                   *
 ************************************************************************
  FILE NAME: SSC-D-25.DAT
  TIME/DATE OF STUDY: 19:15 09/19/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 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    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  ELEVATION DATA: UPSTREAM(FEET) =    251.00  DOWNSTREAM(FEET) =    192.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.150
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.744
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
```

```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "CHAPARRAL,NARROWLEAF"     D        0.33      0.20      1.000    91    5.15
 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) =      0.33   PEAK FLOW RATE(CFS) =      1.35

****************************************************************************
 FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    54.00
 ELEVATION DATA: UPSTREAM(FEET) =    239.00  DOWNSTREAM(FEET) =    224.00

 Tc = 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/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "CHAPARRAL,NARROWLEAF"     D        0.19      0.20      1.000    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      0.79
 TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      0.79
****************************************************************************
 FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
 ELEVATION DATA: UPSTREAM(FEET) =    244.00  DOWNSTREAM(FEET) =    219.00

 Tc = 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/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "CHAPARRAL,NARROWLEAF"     D        0.16      0.20      1.000    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      0.67
 TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.67
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        0.2  TC(MIN.) =      5.00
 EFFECTIVE AREA(ACRES) =      0.16  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =       0.67
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

X. 100-YEAR HYDROLOGY CALCULATIONS

- **Existing 100-Year**
- **Developed 100-Year**

```
**************************************************************************
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                        Analysis prepared by:

                    Adams-Streeter Civil Engineers, Inc.
                             15 Corporate Park
                            Irvine, CA 92606
                              949-474-2330

 ************************* DESCRIPTION OF STUDY *************************
* Q100 STORM EVENT                                                      *
* SOUTH SHORES CHURCH                                                   *
* EXISTING CONDITIONS                                                   *
 ************************************************************************

  FILE NAME: CHURCHEX.DAT
  TIME/DATE OF STUDY: 15:01 08/24/2007
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

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

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  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    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    78.00
  ELEVATION DATA: UPSTREAM(FEET) =    274.60  DOWNSTREAM(FEET) =    274.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.757
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.207
```

```
 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.)
 SCHOOL                      D        0.20      0.20       0.60    91    6.76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.60
 SUBAREA RUNOFF(CFS) =      0.92
 TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.92

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   272.20  DOWNSTREAM(FEET) =   264.50
 FLOW LENGTH(FEET) =   126.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.83
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =   4.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.92
 PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =   7.12
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =   204.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   7.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.097
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        D        0.27      0.20       0.50    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.50
 SUBAREA AREA(ACRES) =     0.27      SUBAREA RUNOFF(CFS) =     1.21
 EFFECTIVE AREA(ACRES) =     0.47    AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.54
 TOTAL AREA(ACRES) =      0.47      PEAK FLOW RATE(CFS) =       2.11

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    264.50  DOWNSTREAM(FEET) =    237.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   115.80   CHANNEL SLOPE =  0.2375
 CHANNEL BASE(FEET) =     0.00   "Z" FACTOR =   1.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.025
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
```

```
  ".4 DWELLING/ACRE"          D        0.12      0.20      0.90     91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.37
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.66
  AVERAGE FLOW DEPTH(FEET) =   0.42   TRAVEL TIME(MIN.) =   0.14
  Tc(MIN.) =   7.26
  SUBAREA AREA(ACRES) =     0.12      SUBAREA RUNOFF(CFS) =     0.52
  EFFECTIVE AREA(ACRES) =     0.59    AREA-AVERAGED Fm(INCH/HR) =   0.12
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.62
  TOTAL AREA(ACRES) =     0.59        PEAK FLOW RATE(CFS) =       2.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.43   FLOW VELOCITY(FEET/SEC.) =  13.95
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =   319.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    237.00  DOWNSTREAM(FEET) =    227.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    34.00   CHANNEL SLOPE =  0.2794
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
  CHANNEL FLOW THRU SUBAREA(CFS) =      2.60
  FLOW VELOCITY(FEET/SEC.) =  14.58   FLOW DEPTH(FEET) =   0.42
  TRAVEL TIME(MIN.) =   0.04   Tc(MIN.) =   7.30
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =   353.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    31.50
  ELEVATION DATA: UPSTREAM(FEET) =    265.30  DOWNSTREAM(FEET) =    265.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 D        0.07      0.20       0.20     91    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.20
  SUBAREA RUNOFF(CFS) =      0.39
  TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.39

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  41
```

```
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   263.00  DOWNSTREAM(FEET) =   262.50
 FLOW LENGTH(FEET) =    24.90   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.34
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =   4.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.39
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   5.12
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =    56.40 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    104.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   102.10
 ELEVATION DATA: UPSTREAM(FEET) =    262.50  DOWNSTREAM(FEET) =    227.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.11      0.20       0.90    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.11   INITIAL SUBAREA RUNOFF(CFS) =    0.59

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.126
 SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.59
 EFFECTIVE AREA(ACRES) =     0.18   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.63
 TOTAL AREA(ACRES) =     0.18       PEAK FLOW RATE(CFS) =       0.97

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1       0.97   5.12     6.126  0.20( 0.13) 0.63      0.2      110.00
 LONGEST FLOWPATH FROM NODE    110.00 TO NODE    104.00 =    56.40 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1       2.60   7.30     5.004  0.20( 0.12) 0.62      0.6      100.00
```

```
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =   353.80 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM     Q      Tc    Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER   (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)          (ACRES)    NODE
     1      3.22   5.12     6.126   0.20( 0.12) 0.62      0.6      110.00
     2      3.39   7.30     5.004   0.20( 0.12) 0.62      0.8      100.00
   TOTAL AREA(ACRES) =      0.77

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       3.39  Tc(MIN.) =    7.297
 EFFECTIVE AREA(ACRES) =     0.77  AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.62
 TOTAL AREA(ACRES) =      0.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =   353.80 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.70
 ELEVATION DATA: UPSTREAM(FEET) =    265.30  DOWNSTREAM(FEET) =    264.60

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 APARTMENTS                  D        0.06      0.20       0.20    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.20
 SUBAREA RUNOFF(CFS) =      0.33
 TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.33

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   171.20
 ELEVATION DATA: UPSTREAM(FEET) =    264.60  DOWNSTREAM(FEET) =    190.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.39      0.20       0.90    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.39   INITIAL SUBAREA RUNOFF(CFS) =     2.11

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =    5.00
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA AREA(ACRES) =     0.39      SUBAREA RUNOFF(CFS) =     2.11
 EFFECTIVE AREA(ACRES) =     0.45   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.81
 TOTAL AREA(ACRES) =     0.45       PEAK FLOW RATE(CFS) =       2.44

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    68.00
 ELEVATION DATA: UPSTREAM(FEET) =    274.30  DOWNSTREAM(FEET) =    264.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "8-10 DWELLINGS/ACRE"      D        0.09      0.20       0.40     91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.40
 SUBAREA RUNOFF(CFS) =      0.49
 TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.49

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   262.50  DOWNSTREAM(FEET) =   254.50
 FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.37
 GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.49
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =   5.12
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =   126.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.130
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.09      0.20       0.90     91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.09      SUBAREA RUNOFF(CFS) =     0.48
 EFFECTIVE AREA(ACRES) =     0.18   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.65
```

```
 TOTAL AREA(ACRES) =      0.18       PEAK FLOW RATE(CFS) =       0.97

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    97.00
 ELEVATION DATA: UPSTREAM(FEET) =    254.50  DOWNSTREAM(FEET) =    225.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)   (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.18      0.20       0.90    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.18   INITIAL SUBAREA RUNOFF(CFS) =    0.97

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.130
 SUBAREA AREA(ACRES) =    0.18      SUBAREA RUNOFF(CFS) =    0.96
 EFFECTIVE AREA(ACRES) =     0.36   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.78
 TOTAL AREA(ACRES) =     0.36       PEAK FLOW RATE(CFS) =       1.94

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    67.00
 ELEVATION DATA: UPSTREAM(FEET) =    265.50  DOWNSTREAM(FEET) =    264.70

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.070
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.154
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)   (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "5-7 DWELLINGS/ACRE"        D        0.09      0.20       0.50    91    5.07
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.50
 SUBAREA RUNOFF(CFS) =      0.49
 TOTAL AREA(ACRES) =      0.09   PEAK FLOW RATE(CFS) =      0.49

****************************************************************************
 FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   262.70  DOWNSTREAM(FEET) =   254.50
```

```
 FLOW LENGTH(FEET) =    88.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.18
 GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      0.49
 PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =   5.27
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =   155.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    142.00 TO NODE    143.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.50
 ELEVATION DATA: UPSTREAM(FEET) =    254.50  DOWNSTREAM(FEET) =    235.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.17      0.20       0.90    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =    0.17   INITIAL SUBAREA RUNOFF(CFS) =    0.92

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.27
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.048
 SUBAREA AREA(ACRES) =    0.17      SUBAREA RUNOFF(CFS) =    0.90
 EFFECTIVE AREA(ACRES) =     0.26   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =     0.26       PEAK FLOW RATE(CFS) =       1.38

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   132.00
 ELEVATION DATA: UPSTREAM(FEET) =    265.00  DOWNSTREAM(FEET) =    235.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"         D        0.21      0.20       0.90    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA RUNOFF(CFS) =      1.14
 TOTAL AREA(ACRES) =      0.21   PEAK FLOW RATE(CFS) =      1.14

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

```
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    87.50
 ELEVATION DATA: UPSTREAM(FEET) =    251.00  DOWNSTREAM(FEET) =    216.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.32      0.20       0.90    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA RUNOFF(CFS) =      1.73
 TOTAL AREA(ACRES) =      0.32   PEAK FLOW RATE(CFS) =      1.73

****************************************************************************
 FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   172.00
 ELEVATION DATA: UPSTREAM(FEET) =    265.80  DOWNSTREAM(FEET) =    251.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 CONDOMINIUMS                D        0.19      0.20       0.35    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.35
 SUBAREA RUNOFF(CFS) =      1.05
 TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      1.05

****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    301.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.11      0.20       0.10    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.61
 EFFECTIVE AREA(ACRES) =     0.30   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.26
 TOTAL AREA(ACRES) =     0.30       PEAK FLOW RATE(CFS) =       1.66
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   249.00  DOWNSTREAM(FEET) =   247.00
 FLOW LENGTH(FEET) =   101.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.52
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      1.66
 PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =   5.31
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =   273.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.31
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.033
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.12      0.20       0.10     91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =     0.12      SUBAREA RUNOFF(CFS) =     0.65
 EFFECTIVE AREA(ACRES) =     0.42   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.21
 TOTAL AREA(ACRES) =     0.42       PEAK FLOW RATE(CFS) =       2.26

****************************************************************************
 FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   247.00  DOWNSTREAM(FEET) =   245.00
 FLOW LENGTH(FEET) =   101.50   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.97
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      2.26
 PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =   5.59
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =   374.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   141.00
 ELEVATION DATA: UPSTREAM(FEET) =    252.50  DOWNSTREAM(FEET) =    249.80

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.489
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.906
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 "1 DWELLING/ACRE"           D        0.23      0.20       0.80    91    7.49
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.80
 SUBAREA RUNOFF(CFS) =      0.98
 TOTAL AREA(ACRES) =      0.23   PEAK FLOW RATE(CFS) =      0.98

****************************************************************************
 FLOW PROCESS FROM NODE    311.00 TO NODE    311.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   7.49
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.906
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.11      0.20       0.10    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    0.11      SUBAREA RUNOFF(CFS) =    0.48
 EFFECTIVE AREA(ACRES) =     0.34   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =     0.34       PEAK FLOW RATE(CFS) =       1.47

****************************************************************************
 FLOW PROCESS FROM NODE    311.00 TO NODE    303.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   247.80  DOWNSTREAM(FEET) =   245.00
 FLOW LENGTH(FEET) =    26.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.11
 GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      1.47
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   7.53
 LONGEST FLOWPATH FROM NODE    310.00 TO NODE    303.00 =   167.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM     Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER   (CFS) (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
    1      1.47   7.53    4.891  0.20( 0.11) 0.57     0.3      310.00
 LONGEST FLOWPATH FROM NODE    310.00 TO NODE    303.00 =   167.00 FEET.
```

```
 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM      Q      Tc    Intensity    Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)          (ACRES)     NODE
     1       2.26    5.59     5.886  0.20( 0.04) 0.21      0.4      300.00
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =   374.50 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc    Intensity    Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.)  (INCH/HR)  (INCH/HR)          (ACRES)     NODE
     1       3.58    5.59     5.886  0.20( 0.07) 0.35      0.7      300.00
     2       3.34    7.53     4.891  0.20( 0.07) 0.37      0.8      310.00
   TOTAL AREA(ACRES) =      0.76

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        3.58  Tc(MIN.) =    5.588
 EFFECTIVE AREA(ACRES) =      0.67  AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.37
 TOTAL AREA(ACRES) =      0.76
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =   374.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    403.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   245.00  DOWNSTREAM(FEET) =   225.70
 FLOW LENGTH(FEET) =    81.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.78
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      3.58
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =   5.67
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    403.00 =   455.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN) =   5.67
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.845
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.05      0.20       0.90    91
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.05      SUBAREA RUNOFF(CFS) =     0.25
 EFFECTIVE AREA(ACRES) =     0.72    AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.39
 TOTAL AREA(ACRES) =      0.81      PEAK FLOW RATE(CFS) =       3.75

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    62.00
 ELEVATION DATA: UPSTREAM(FEET) =    275.20  DOWNSTREAM(FEET) =    273.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 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        0.10      0.20       0.10    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA RUNOFF(CFS) =      0.56
 TOTAL AREA(ACRES) =      0.10   PEAK FLOW RATE(CFS) =      0.56

****************************************************************************
 FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   509.00
 ELEVATION DATA: UPSTREAM(FEET) =    273.00  DOWNSTREAM(FEET) =    250.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.862
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.229
 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        2.03      0.20       0.10    91    6.86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.10
 SUBAREA AREA(ACRES) =    2.03   INITIAL SUBAREA RUNOFF(CFS) =    9.52

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =   5.00
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.190
 SUBAREA AREA(ACRES) =    2.03      SUBAREA RUNOFF(CFS) =   11.27
 EFFECTIVE AREA(ACRES) =     2.13   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =     2.13       PEAK FLOW RATE(CFS) =      11.83

****************************************************************************
 FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   243.60  DOWNSTREAM(FEET) =   225.70
 FLOW LENGTH(FEET) =   123.30   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS    9.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.60
```

```
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     11.83
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =   5.11
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =   185.30 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1     11.83   5.11     6.133  0.20( 0.02) 0.10     2.1      400.00
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =   185.30 FEET.

 ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1      3.75   5.67     5.845  0.20( 0.08) 0.39     0.7      300.00
     2      3.49   7.61     4.866  0.20( 0.08) 0.41     0.8      310.00
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    403.00 =   455.50 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap   Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)        (ACRES)     NODE
     1     15.38   5.11     6.133  0.20( 0.03) 0.17     2.8      400.00
     2     15.02   5.67     5.845  0.20( 0.03) 0.17     2.9      300.00
     3     12.87   7.61     4.866  0.20( 0.04) 0.18     2.9      310.00
   TOTAL AREA(ACRES) =      2.94

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       15.38  Tc(MIN.) =    5.110
 EFFECTIVE AREA(ACRES) =      2.78  AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.17
 TOTAL AREA(ACRES) =      2.94
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    403.00 =   455.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   225.70  DOWNSTREAM(FEET) =   209.30
 FLOW LENGTH(FEET) =    79.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  22.35
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     15.38
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   5.17
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    404.00 =   534.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    404.00 TO NODE    502.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   211.00  DOWNSTREAM(FEET) =   210.50
 FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.96
 (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
  AT DEPTH = 0.82 * DIAMETER)
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     15.38
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   5.18
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    502.00 =   544.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE      0.00 TO NODE      0.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   143.00
 ELEVATION DATA: UPSTREAM(FEET) =    263.50  DOWNSTREAM(FEET) =    252.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.869
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.741
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.07      0.20       0.90    91    5.87
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA RUNOFF(CFS) =      0.35
 TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.35

****************************************************************************
 FLOW PROCESS FROM NODE    501.00 TO NODE    502.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   336.00
 ELEVATION DATA: UPSTREAM(FEET) =    252.00  DOWNSTREAM(FEET) =    210.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.581
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.876
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 RESIDENTIAL
 ".4 DWELLING/ACRE"          D        0.24      0.20      0.90     91     7.58
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.90
 SUBAREA AREA(ACRES) =     0.24   INITIAL SUBAREA RUNOFF(CFS) =     1.01

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN) =    5.87
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.741
 SUBAREA AREA(ACRES) =     0.24      SUBAREA RUNOFF(CFS) =     1.20
 EFFECTIVE AREA(ACRES) =     0.31   AREA-AVERAGED Fm(INCH/HR) =  0.18
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.90
 TOTAL AREA(ACRES) =     0.31       PEAK FLOW RATE(CFS) =       1.55

****************************************************************************
 FLOW PROCESS FROM NODE    502.00 TO NODE    502.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       1.55   5.87     5.741  0.20( 0.18) 0.90      0.3      500.00
 LONGEST FLOWPATH FROM NODE    500.00 TO NODE    502.00 =   143.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      15.38   5.18     6.095  0.20( 0.03) 0.17      2.8      400.00
     2      15.02   5.74     5.807  0.20( 0.03) 0.17      2.9      300.00
     3      12.87   7.69     4.844  0.20( 0.04) 0.18      2.9      310.00
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    502.00 =   544.50 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      16.83   5.18     6.095  0.20( 0.05) 0.23      3.1      400.00
     2      16.56   5.74     5.807  0.20( 0.05) 0.24      3.2      300.00
     3      16.43   5.87     5.741  0.20( 0.05) 0.24      3.2      500.00
     4      14.17   7.69     4.844  0.20( 0.05) 0.25      3.2      310.00
   TOTAL AREA(ACRES) =      3.25

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      16.83  Tc(MIN.) =    5.185
 EFFECTIVE AREA(ACRES) =     3.05  AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.24
 TOTAL AREA(ACRES) =     3.25
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    502.00 =   544.50 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =     3.25  TC(MIN.) =      5.18
 EFFECTIVE AREA(ACRES) =      3.05  AREA-AVERAGED Fm(INCH/HR)=  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.23
 PEAK FLOW RATE(CFS)    =    16.83

 ** PEAK FLOW RATE TABLE **
  STREAM      Q      Tc   Intensity   Fp(Fm)      Ap    Ae      HEADWATER
  NUMBER    (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1      16.83   5.18     6.095  0.20( 0.05) 0.23      3.1      400.00
```

2	16.56	5.74	5.807	0.20(0.05)	0.24	3.2	300.00
3	16.43	5.87	5.741	0.20(0.05)	0.24	3.2	500.00
4	14.17	7.69	4.844	0.20(0.05)	0.25	3.2	310.00

END OF RATIONAL METHOD ANALYSIS

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

                        Adams-Streeter Civil Engineers, Inc.
                                15 Corporate Park
                                 Irvine, CA 92606
                                   949-474-2330

 ************************** DESCRIPTION OF STUDY **************************
* 100-YEAR FREQUENCY                                                      *
* AREAS A, B, AND C                                                       *
* SOUTH SHORES CHURCH, DANA POINT                                         *
 *************************************************************************

  FILE NAME: SSC-A-B.DAT
  TIME/DATE OF STUDY: 13:43 02/13/2012
=============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.    (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================   ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  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

+---------------------------------------------------------------------------+
| AREA - A                                                                  |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

*****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=============================================================================
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   240.00
 ELEVATION DATA: UPSTREAM(FEET) =    274.00  DOWNSTREAM(FEET) =    265.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.250
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.017
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  D        0.06      0.20      0.100    91    5.25
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.32
 TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.32

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   263.00  DOWNSTREAM(FEET) =   261.00
 FLOW LENGTH(FEET) =   127.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.28
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.32
 PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =    5.89
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     367.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.89
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.631
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.44      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) =    0.44      SUBAREA RUNOFF(CFS) =    2.22
 EFFECTIVE AREA(ACRES) =      0.50   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       0.5       PEAK FLOW RATE(CFS) =       2.52

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.89
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.631
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.12      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) =     0.12      SUBAREA RUNOFF(CFS) =     0.61
 EFFECTIVE AREA(ACRES) =      0.62   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.6       PEAK FLOW RATE(CFS) =       3.13

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   261.00  DOWNSTREAM(FEET) =   259.50
 FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.05
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.13
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    5.99
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     412.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.99
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.580
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.05      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) =     0.05      SUBAREA RUNOFF(CFS) =     0.25
 EFFECTIVE AREA(ACRES) =      0.67   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.7       PEAK FLOW RATE(CFS) =       3.35

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  82
----------------------------------------------------------------------------
 >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
 >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   166.00
 ELEVATION DATA: UPSTREAM(FEET) =    275.50  DOWNSTREAM(FEET) =    265.50

 Tc = 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/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  D        0.16      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 AREA(ACRES) =     0.16   INITIAL SUBAREA RUNOFF(CFS) =     0.89

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
```

```
 MAINLINE Tc(MIN.) =    5.99
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.580
 SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    0.80
 EFFECTIVE AREA(ACRES) =      0.83   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       4.15

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   259.50  DOWNSTREAM(FEET) =   259.00
 FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.23
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.15
 PIPE TRAVEL TIME(MIN.) =   1.03    Tc(MIN.) =    7.02
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     612.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.02
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.094
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                D        0.26      0.20      0.100    91
 COMMERCIAL                D        0.25      0.20      0.100    91
 COMMERCIAL                D        0.41      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) =    0.92      SUBAREA RUNOFF(CFS) =    4.20
 EFFECTIVE AREA(ACRES) =      1.75   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.8       PEAK FLOW RATE(CFS) =       7.99

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   259.00  DOWNSTREAM(FEET) =   248.50
 FLOW LENGTH(FEET) =   143.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.57
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.99
 PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    7.20
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     755.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  10
----------------------------------------------------------------------------
```

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

****************************************************************************
 FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   247.00
 ELEVATION DATA: UPSTREAM(FEET) =    277.50  DOWNSTREAM(FEET) =    269.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.403
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.919
 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        0.50      0.20      0.100    91    5.40
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.65
 TOTAL AREA(ACRES) =      0.50   PEAK FLOW RATE(CFS) =      2.65

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   263.00  DOWNSTREAM(FEET) =   255.00
 FLOW LENGTH(FEET) =    96.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.37
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.65
 PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    5.56
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     343.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   376.00
 ELEVATION DATA: UPSTREAM(FEET) =    277.50  DOWNSTREAM(FEET) =    264.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.338
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.401
 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        0.99      0.20      0.100     91     6.34
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      4.79
 TOTAL AREA(ACRES) =      0.99   PEAK FLOW RATE(CFS) =      4.79

****************************************************************************
 FLOW PROCESS FROM NODE    204.00 TO NODE    202.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   257.00  DOWNSTREAM(FEET) =   255.00
 FLOW LENGTH(FEET) =    72.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.29
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.79
 PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    6.48
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    202.00 =     448.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    202.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        4.79    6.48     5.332  0.20( 0.02) 0.10        1.0      203.00
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    202.00 =     448.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        2.65    5.56     5.824  0.20( 0.02) 0.10        0.5      200.00
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     343.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        7.15    5.56     5.824  0.20( 0.02) 0.10        1.3      200.00
     2        7.22    6.48     5.332  0.20( 0.02) 0.10        1.5      203.00
   TOTAL AREA(ACRES) =          1.5

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        7.22  Tc(MIN.) =    6.482
 EFFECTIVE AREA(ACRES) =      1.49  AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.5
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    202.00 =     448.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    202.00 TO NODE    105.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   250.00  DOWNSTREAM(FEET) =   248.50
```

```
 FLOW LENGTH(FEET) =   162.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
 GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.22
 PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    6.93
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    105.00 =     610.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        7.15    6.00    5.573  0.20( 0.02) 0.10        1.3      200.00
     2        7.22    6.93    5.134  0.20( 0.02) 0.10        1.5      203.00
 LONGEST FLOWPATH FROM NODE    203.00 TO NODE    105.00 =     610.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1        7.99    7.20    5.022  0.20( 0.02) 0.10        1.8      100.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     755.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       14.54    6.00    5.573  0.20( 0.02) 0.10        2.8      200.00
     2       15.09    6.93    5.134  0.20( 0.02) 0.10        3.2      203.00
     3       15.06    7.20    5.022  0.20( 0.02) 0.10        3.2      100.00
   TOTAL AREA(ACRES) =          3.2

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       15.09  Tc(MIN.) =    6.926
 EFFECTIVE AREA(ACRES) =      3.17  AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =         3.2
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     755.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.93
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.134
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 D        0.56      0.20      0.100    91
 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) =    0.79      SUBAREA RUNOFF(CFS) =    3.64
 EFFECTIVE AREA(ACRES) =      3.96   AREA-AVERAGED Fm(INCH/HR) =  0.02
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.0       PEAK FLOW RATE(CFS) =      18.25
```

```
+----------------------------------------------------------------------+
| ON-SITE DETENTION SYSTEM                                             |
| PEAK FLOW REDUCTION FROM Q100-18.25 CFS TO Q100=6.84 CFS             |
| MAXIMUM STORAGE VOLUME - 0.217 AC-FT                                 |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =   7
----------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
======================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN.) =    6.96   RAINFALL INTENSITY(INCH/HR) =  5.12
  EFFECTIVE AREA(ACRES) =     1.48
  TOTAL AREA(ACRES) =     4.00         PEAK FLOW RATE(CFS) =      6.84
  AREA-AVERAGED Fm(INCH/HR) =   0.02  AREA-AVERAGED Fp(INCH/HR) =   0.20
  AREA-AVERAGED Ap =  0.10
  NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
        CONFLUENCE ANALYSES.

**********************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  41
----------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
======================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   245.00  DOWNSTREAM(FEET) =   244.00
  FLOW LENGTH(FEET) =    47.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.71
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.84
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    7.05
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     802.00 FEET.

**********************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  41
----------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
======================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   244.00  DOWNSTREAM(FEET) =   225.00
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.55
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.84
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    7.16
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     922.00 FEET.

**********************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  10
----------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
======================================================================
```

```
+----------------------------------------------------------------------+
| AREA - B                                                             |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
======================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   133.00
  ELEVATION DATA: UPSTREAM(FEET) =    250.00  DOWNSTREAM(FEET) =    248.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.619
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.529
  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        0.07      0.20      0.850    91    8.62
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.27

**********************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  41
----------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
======================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   247.00  DOWNSTREAM(FEET) =   245.30
  FLOW LENGTH(FEET) =   168.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.64
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.27
  PIPE TRAVEL TIME(MIN.) =   1.06    Tc(MIN.) =    9.68
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     301.00 FEET.

**********************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  82
----------------------------------------------------------------------
  >>>>>ADD SUBAREA RUNOFF TO MAINLINE, AT MAINLINE Tc,<<<<<
  >>>>>(AND COMPUTE INITIAL SUBAREA RUNOFF)<<<<<
======================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   163.00
  ELEVATION DATA: UPSTREAM(FEET) =    250.00  DOWNSTREAM(FEET) =    248.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.969
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.737
  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.)
  SCHOOL                     D        0.23      0.20      0.600    91    7.97
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.600
```

```
 SUBAREA AREA(ACRES) =     0.23   INITIAL SUBAREA RUNOFF(CFS) =     0.96

 ** ADD SUBAREA RUNOFF TO MAINLINE AT MAINLINE Tc:
 MAINLINE Tc(MIN.) =     9.68
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.238
 SUBAREA AREA(ACRES) =     0.23      SUBAREA RUNOFF(CFS) =     0.85
 EFFECTIVE AREA(ACRES) =      0.30   AREA-AVERAGED Fm(INCH/HR) =  0.13
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.66
 TOTAL AREA(ACRES) =        0.3       PEAK FLOW RATE(CFS) =       1.11

****************************************************************************
 FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =     9.68
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.238
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.11      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) =     0.11      SUBAREA RUNOFF(CFS) =     0.42
 EFFECTIVE AREA(ACRES) =      0.41   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.51
 TOTAL AREA(ACRES) =        0.4       PEAK FLOW RATE(CFS) =       1.53

****************************************************************************
 FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   245.30  DOWNSTREAM(FEET) =   243.80
 FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.34
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       1.53
 PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =   10.23
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     445.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    10.23
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.105
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  D        0.12      0.20      0.100    91
 COMMERCIAL                  D        0.11      0.20      0.100    91
 COMMERCIAL                  D        0.11      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) =     0.34      SUBAREA RUNOFF(CFS) =     1.25
 EFFECTIVE AREA(ACRES) =      0.75   AREA-AVERAGED Fm(INCH/HR) =  0.06
```

```
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.32
 TOTAL AREA(ACRES) =        0.8       PEAK FLOW RATE(CFS) =       2.73

****************************************************************************
 FLOW PROCESS FROM NODE    403.00 TO NODE    108.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   243.80  DOWNSTREAM(FEET) =   225.00
 FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.58
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.73
 PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   10.43
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    108.00 =     595.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        2.73   10.43    4.060  0.20( 0.06) 0.32       0.8     400.00
 LONGEST FLOWPATH FROM NODE    400.00 TO NODE    108.00 =     595.00 FEET.

 ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        6.84    7.16    5.035  0.20( 0.02) 0.10       1.5     100.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     922.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
    1        9.17    7.16    5.035  0.20( 0.03) 0.16       2.0     100.00
    2        8.24   10.43    4.060  0.20( 0.04) 0.18       2.2     400.00
   TOTAL AREA(ACRES) =         4.8

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =        9.17  Tc(MIN.) =    7.164
 EFFECTIVE AREA(ACRES) =      2.00  AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =        4.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     922.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   225.00  DOWNSTREAM(FEET) =   220.00
 FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  18.07
```

```
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        9.17
 PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    7.20
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     957.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.20
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.022
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)   (DECIMAL)  CN
 COMMERCIAL                  D        0.22      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) =     0.22      SUBAREA RUNOFF(CFS) =     0.99
 EFFECTIVE AREA(ACRES) =      2.22   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.15
 TOTAL AREA(ACRES) =         5.0       PEAK FLOW RATE(CFS) =        9.95

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   220.00  DOWNSTREAM(FEET) =   210.00
 FLOW LENGTH(FEET) =    27.00   MANNING'S N =  0.013
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  26.51
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        9.95
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    7.21
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     984.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

+--------------------------------------------------------------------------+
| AREA - C                                                                 |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
 FLOW PROCESS FROM NODE    500.00 TO NODE    501.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
================================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =    263.00  DOWNSTREAM(FEET) =    248.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.123
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.509
  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        0.08      0.20      0.850    91    6.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.08   PEAK FLOW RATE(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE    501.00 TO NODE    110.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    248.00  DOWNSTREAM(FEET) =    210.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   292.00   CHANNEL SLOPE =  0.1301
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.204
  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
  "CHAPARRAL,BROADLEAF"      D        0.13      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) =       0.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.62
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   0.64
  Tc(MIN.) =    6.76
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.59
  EFFECTIVE AREA(ACRES) =      0.21     AREA-AVERAGED Fm(INCH/HR) =   0.19
  AREA-AVERAGED Fp(INCH/HR) =   0.20  AREA-AVERAGED Ap =   0.94
  TOTAL AREA(ACRES) =        0.2          PEAK FLOW RATE(CFS) =       0.95

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   8.14
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    110.00 =     462.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
   STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
   NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        0.95    6.76    5.204  0.20( 0.19) 0.94        0.2      500.00
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    110.00 =     462.00 FEET.
```

```
** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
    1        9.95    7.21    5.015  0.20( 0.03) 0.15        2.2      100.00
    2        8.86   10.48    4.049  0.20( 0.03) 0.17        2.5      400.00
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     984.00 FEET.

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
    1       10.63    6.76    5.204  0.20( 0.04) 0.22        2.3      500.00
    2       10.86    7.21    5.015  0.20( 0.04) 0.22        2.4      100.00
    3        9.59   10.48    4.049  0.20( 0.05) 0.23        2.7      400.00
  TOTAL AREA(ACRES) =          5.2

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       10.86  Tc(MIN.) =    7.213
EFFECTIVE AREA(ACRES) =      2.43  AREA-AVERAGED Fm(INCH/HR) =  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.22
TOTAL AREA(ACRES) =         5.2
LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     984.00 FEET.
================================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)      =        5.2  TC(MIN.) =      7.21
EFFECTIVE AREA(ACRES) =       2.43  AREA-AVERAGED Fm(INCH/HR)=  0.04
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.220
PEAK FLOW RATE(CFS)    =      10.86

** PEAK FLOW RATE TABLE **
 STREAM       Q      Tc    Intensity   Fp(Fm)      Ap      Ae      HEADWATER
 NUMBER     (CFS)   (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
    1       10.63    6.76    5.204  0.20( 0.04) 0.22        2.3      500.00
    2       10.86    7.21    5.015  0.20( 0.04) 0.22        2.4      100.00
    3        9.59   10.48    4.049  0.20( 0.05) 0.23        2.7      400.00
================================================================================
================================================================================
END OF RATIONAL METHOD ANALYSIS
```

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

                    Adams-Streeter Civil Engineers, Inc.
                             15 Corporate Park
                              Irvine, CA 92606
                                949-474-2330

 ************************** DESCRIPTION OF STUDY **************************
* PROPOSED CONDIDTION - AREA "D" (EASTERLY SLOPE)                         *
* 100-YEAR FREQUENCY STORM                                                *
* SOUTH SHORES CHURCH, DANA POINT, CA                                     *
 **************************************************************************

  FILE NAME: SSC-D-25.DAT
  TIME/DATE OF STUDY: 10:56 09/21/2011
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  *DATA BANK RAINFALL USED*
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  ======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 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    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   175.00
  ELEVATION DATA: UPSTREAM(FEET) =    251.00  DOWNSTREAM(FEET) =    192.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.150
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  6.083
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
```

```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "CHAPARRAL,NARROWLEAF"     D        0.33      0.20      1.000    91    5.15
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.75
 TOTAL AREA(ACRES) =      0.33   PEAK FLOW RATE(CFS) =      1.75
****************************************************************************
 FLOW PROCESS FROM NODE    700.00 TO NODE    701.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    54.00
 ELEVATION DATA: UPSTREAM(FEET) =    239.00  DOWNSTREAM(FEET) =    224.00

 Tc = 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  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "CHAPARRAL,NARROWLEAF"     D        0.19      0.20      1.000    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      1.02
 TOTAL AREA(ACRES) =      0.19   PEAK FLOW RATE(CFS) =      1.02
****************************************************************************
 FLOW PROCESS FROM NODE    800.00 TO NODE    801.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
 ELEVATION DATA: UPSTREAM(FEET) =    244.00  DOWNSTREAM(FEET) =    219.00

 Tc = 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  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL POOR COVER
 "CHAPARRAL,NARROWLEAF"     D        0.16      0.20      1.000    91    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      0.86
 TOTAL AREA(ACRES) =      0.16   PEAK FLOW RATE(CFS) =      0.86
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        0.2  TC(MIN.) =      5.00
 EFFECTIVE AREA(ACRES) =      0.16  AREA-AVERAGED Fm(INCH/HR)=  0.20
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =       0.86
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

XI. On-Site Detention Basin Calculations

- Detention Basin Volume & Outflow Calculations
- Y-Bar Calculations
- 25-Year Frequency
- 100-Year Frequency

DETENTION BASIN SIZING

CALCULATION OF DETENTION BASIN OUTLET CAPACITY THE OUTLET CONSISTS OF A RESTRICTOR PLATE PLACED ON THE TOP 9" OF A 18" RCP AT THE OUTLET OF THE DETENTION BASIN. THE BOTTOM 9-INCHES ARE OPEN AND THE CAPACITY OF THE OUTLET IS BASED UPON THE SUBMERGED ORIFICE EQUATION. THE OUTFLOW RATE FOR THE SUBMERGED ORIFICE IS BASED, IN PART, BY THE HEAD DIFFERENCE BETWEEN THE WATER SURFACES ON EACH SIDE OF THE ORIFICE OPENING.

THE SUBMERGED ORIFICE EQUATION IS: $Q=0.63A(2G\Delta H)^{1/2}$ WHERE A IS THE OPENING AREA IN SF, ΔH IS THE DIFFERENCE IN DEPTHS ON EACH SIDE OF THE ORIFICE OPENING (MEASURED FROM THE CENTROID OF THE ORIFICE OPENING). G IS EQUAL TO 32.2 FPS.

AREA OF 9 INCH OPENING= 0.880 SQUARE FEET

DEPTH OF WATER IN BASIN (FTS)	ASSUMED DEPTH OF FLOW AT ORIFICE (FT)	CALCULATED, Q $Q=0.63A(2G\Delta H)^{1/2}$ (FT)	BASIN OUTLET INVERT ELEVATION (FT)	PONDED WATER SURFACE ELEVATION (FT)
0.75	0.37	2.74	100	100.75
1.00	0.37	3.53	100	101.00
1.50	0.37	4.73	100	101.50
2.00	0.37	5.68	100	102.00
2.50	0.37	6.49	100	102.50
3.00	0.37	7.22	100	103.00
3.50	0.37	7.87	100	103.50
4.00	0.37	8.48	100	104.00
4.50	0.37	9.04	100	104.50
5.00	0.37	9.57	100	105.00
5.50	0.37	10.08	100	105.50
6.00	0.37	10.56	100	106.00
6.50	0.37	11.02	100	106.50
7.00	0.37	11.46	100	107.00
7.50	0.37	11.88	100	107.50
8.00	0.37	12.29	100	108.00

SIZE AND INVERT ELEVATIONS OF UNDERGROUND STORAGE BASIN

BASIN NO	BASIN LENGTH	BASIN WIDTH	BASIN HEIGHT	BASIN AREA (SF)	OUTLET INVERT ELEV (FT)
1	80	40	8	3200	100

VOLUME OF UNDERGROUND STORAGE BASIN

DEPTH OF WATER IN BASIN (FT)	INCREMENTAL VOLUME (CUBIC FEET)	ACCUMULATED VOLUME (CUBIC FEET)	ACCUMULATED VOLUME (ACRE-FEET)
0	0	0	0
0.75	2400	2400	0.055
1.00	800	3200	0.073
1.50	1600	4800	0.110
2.00	1600	6400	0.147
2.50	1600	8000	0.184
3.00	1600	9600	0.220
3.50	1600	11200	0.257
4.00	1600	12800	0.294
4.50	1600	14400	0.331
5.00	1600	16000	0.367
5.50	1600	17600	0.404
6.00	1600	19200	0.441
6.50	1600	20800	0.478
7.00	1600	22400	0.514
7.50	1600	24000	0.551
8.00	1600	25600	0.588

OUTFLOW RATING DATA FOR:
OUTFLOW WITH RESTRICTOR PLATE AT 18" DIAMETER OUTLET OF BASIN
ET TO CONSTRICT FLOWS WITH ONLY THE BOTTOM 0.875 FEET (10.5") OPEN.

PONDED WATER SURFACE ELEVATION (FT)	DEPTH OF FLOW AT BASIN OUTLET (FT)	ACCUMULATED VOLUME (ACRE-FEET)	OUTFLOW CFS
100	0	0.000	0
100.75	0.75	0.055	2.74
101.00	1.00	0.073	3.53
101.50	1.50	0.110	4.73
102.00	2.00	0.147	5.68
102.50	2.50	0.184	6.49
103.00	3.00	0.220	7.22
103.50	3.50	0.257	7.87
104.00	4.00	0.294	8.48
104.50	4.50	0.331	9.04
105.00	5.00	0.367	9.57
105.50	5.50	0.404	10.08
106.00	6.00	0.441	10.56
106.50	6.50	0.478	11.02

SOUTH SHORES CHURCH - DANA POINT
CALCULATION OF LOW LOSS RATE, Y_{BAR}

The low loss rate is required to perform hydrograph calculations. The low loss rate, Y_{BAR} is defined in the A38, formula (C.5) as:

$$Y_{BAR} = 1-Y$$

Where:

$$Y = \frac{(P_{24}-Ia)^2}{(P_{24}-Ia+S)P_{24}}$$

P_{24}= 24-hour storm rainfall

Ia= 0.2 * S

$$S = \frac{1000}{CN} - 10$$

CN is found by utilizing the Orange County Hydrology Manual Figure C-3 and Figure C-4. The AES software used to develop the peak flow rates lists the CN value for each sub-area. A composite CN value is shown on Table 1. That composite is shown herein.

CN= 75

The CN value of 75 is for AMC Condition II
AMC I is used for 2- and 5- year storm events; AMC II is used for 10-, 25- and 50- year events; AMC III is used for the 100-year event.

Table C.1 of the Orange County Hydrology Manual shows that for an AMC II CN of 75 the AMC I CN is 57 and the AMC III CN is 91

The calculated values of S are:

				And Ia= 02 * S			
(AMC III) S=	$\frac{1000}{CN} - 10$			(AMCIII) Ia	0.99 * 0.2	=	0.20
=	$\frac{1000}{91} - 10$	=	0.99				
(AMC II) S=	$\frac{1000}{CN} - 10$			(AMCII) Ia=	3.33 * 0.2	=	0.67
=	$\frac{1000}{75} - 10$	=	3.33				
(AMC I) S=	$\frac{1000}{CN} - 10$			(AMCI) Ia=	7.54 * 0.2	=	1.51
=	$\frac{1000}{57} - 10$	=	7.54				

SOUTH SHORES CHURCH - DANA POINT
CALCULATION OF LOW LOSS RATE, Y_{BAR}

Y_{BAR} = 1-Y and $Y = \frac{(P_{24}-Ia)^2}{(P_{24}-Ia+S)P_{24}}$

For 100-year event, AMC III

P_{24}= 5.63 inches per the Table B.1 from the Orange County Hydrology Manual

$Y = \frac{(5.63-0.20)^2}{(5.63-0.20+0.92)*5.63}$

= 0.82

AMC III Y_{BAR} = 1-Y

= 0.18

For 25-year event, AMC II

P_{24}= 4.49 inches per the Table B.1 from the Orange County Hydrology Manual

$Y = \frac{(4.49-0.67)^2}{(4.49-0.67+3.09)*4.49}$

= 0.45

AMC II Y_{BAR} = 1-Y

= **0.55**

For 10-year event, AMC II

P_{24}= 3.68 inches per the Table B.1 from the Orange County Hydrology Manual

$Y = \frac{(3.68-0.67)^2}{(3.68-0.67+3.09)*3.68}$

= 0.39

AMC II Y_{BAR} = 1-Y

= 0.61

For 5-year event, AMC I

P_{24}= 3.03 inches per the Table B.1 from the Orange County Hydrology Manual

$Y = \frac{(3.03-1.51)^2}{3.03-1.51+7.18)*3.03}$

= 0.08

AMC I Y_{BAR} = 1-Y

= 0.92

SOUTH SHORES CHURCH - DANA POINT
CALCULATION OF LOW LOSS RATE, Y_{BAR}

For 2-year event, AMC I	P_{24}=	2.05 inches per the Table B.1 from the Orange County Hydrology Manual	
	Y =	$\frac{(2.05-1.44)^2}{2.05-1.44+7.18)*2.05}$	
	=	0.02	
AMC I	Y_{BAR} =	1-Y	
	=	0.98	

SOUTH SHORES CHURCH - DANA POINT

WEIGHTED CN (AMC II) BASED UPON RATIONAL METHOD (AES)
PRINTOUT FOR THE 25YEAR-YEAR PEAK FLOW RATES

SUB-AREA	AREA	CN (AMCII)	WEIGHTED CN
A-1	0.06	75	4.50
A-2	0.12	75	9.00
A-3	0.44	75	33.00
A-4	0.05	75	3.75
A-5	0.16	75	12.00
A-6	0.26	75	19.50
A-7	0.25	75	18.75
A-8	0.41	75	30.75
A-9	0.50	75	37.50
A-10	0.99	75	74.25
A-11	0.56	75	42.00
A-12	0.23	75	17.25
SUM	4.03		302.25
AVERAGE		**75.0**	

SOUTH SHORES CHURCH - DANA POINT

WEIGHTED CN (AMC II) BASED UPON RATIONAL METHOD (AES)
PRINTOUT FOR THE 25YEAR-YEAR PEAK FLOW RATES

SUB-AREA	AREA	CN (AMCII)	% Pervious	Weighted %
A-1	0.06	75	0.10	0.01
A-2	0.12	75	0.10	0.01
A-3	0.44	75	0.10	0.04
A-4	0.05	75	0.10	0.01
A-5	0.16	75	0.10	0.02
A-6	0.26	75	0.10	0.03
A-7	0.25	75	0.10	0.03
A-8	0.41	75	0.10	0.04
A-9	0.50	75	0.10	0.05
A-10	0.99	75	0.10	0.10
A-11	0.56	75	0.10	0.06
A-12	0.23	75	0.10	0.02
SUM	3.24			0.324
AVERAGE				**10%**

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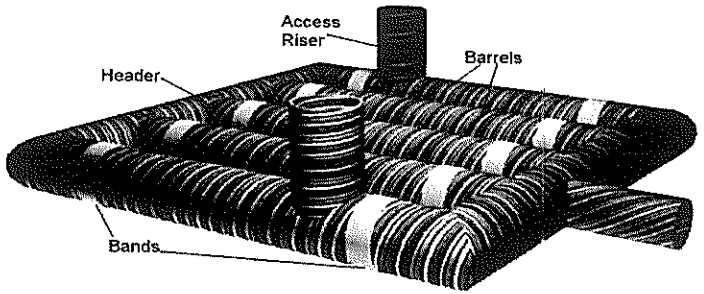


Project Summary

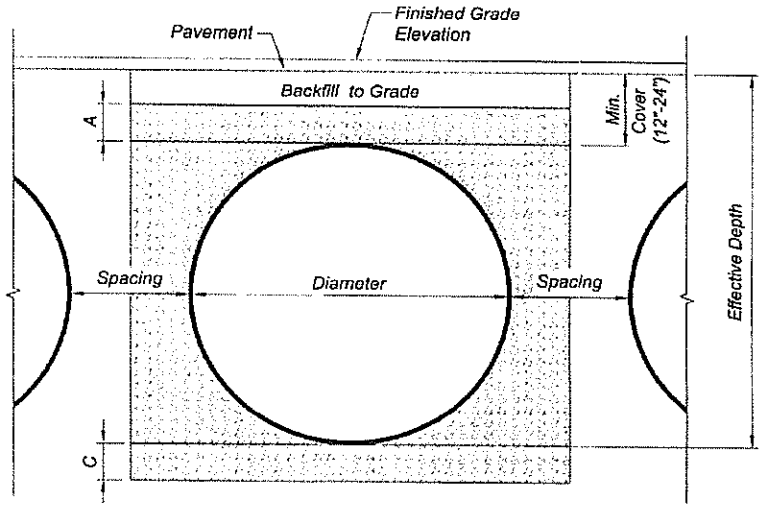
Date:	FEBRUARY, 2012
Project Name:	SOUTH SHORES CHURCH
City / County:	DANA POINT, ORANGE COUNTY
State:	CA
Designed By:	NICK STREETER
Company:	ADAMS-STREETER CIVIL ENGINEERS
Telephone:	949.474.2330

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	10,000
Limiting Width (ft):	20.00
Invert Depth Below Asphalt (ft):	15.00
Solid or Perforated Pipe:	Solid
Shape Or Diameter (in):	84
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	0
Depth A: Porous Stone Above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	0
Stone Porosity (0 to 40%):	40

38.48 ft^2 Pipe Area



System Sizing

Pipe Storage:	10,006	cf	
Porous Stone Storage:	0	cf	
Total Storage Provided:	10,006	cf	100.1% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	113.0	ft	
Length Per Header:	17.0	ft	
Rectangular Footprint (W x L):	17. ft x 127. ft		

CONTECH Materials

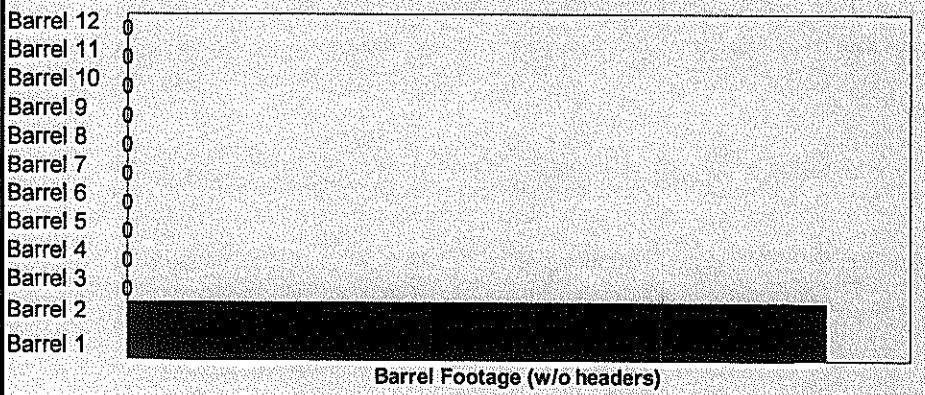
Total CMP Footage:	260	ft
Approximate Total Pieces:	12	pcs
Approximate Coupling Bands:	12	bands
Approximate Truckloads:	6	trucks

Construction Quantities**

Total Excavation:	1200	cy
Porous Stone Backfill For Storage:	0	cy stone
Backfill to Grade Excluding Stone:	829	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



```
**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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            Ver. 15.0  Release Date: 04/01/2008  License ID 1204

                          Analysis prepared by:

                    Adams-Streeter Civil Engineers, Inc.
                              15 Corporate Park
                             Irvine, CA 92606
                               949-474-2330

**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  25-YEAR FREQUENCY
  HYDROGRAPH
  SOUTH SHORES CHURCH, DANA POINT
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    4.03
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.020
    LOW LOSS FRACTION = 0.550
    TIME OF CONCENTRATION(MIN.) =  6.96
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.87
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.94
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.71
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.49

--------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.20
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.31

**************************************************************************
  TIME      VOLUME        Q    0.        5.0       10.0       15.0       20.0
 (HOURS)     (AF)       (CFS)
--------------------------------------------------------------------------
  0.11       0.0008      0.17  Q          .          .          .          .
  0.22       0.0025      0.18  Q          .          .          .          .
  0.34       0.0042      0.18  Q          .          .          .          .
  0.46       0.0059      0.18  Q          .          .          .          .
  0.57       0.0076      0.18  Q          .          .          .          .
  0.69       0.0093      0.18  Q          .          .          .          .
  0.80       0.0110      0.18  Q          .          .          .          .
  0.92       0.0128      0.18  Q          .          .          .          .
  1.04       0.0145      0.18  Q          .          .          .          .
  1.15       0.0163      0.19  Q          .          .          .          .
  1.27       0.0181      0.19  Q          .          .          .          .
  1.38       0.0199      0.19  Q          .          .          .          .
```

1.50	0.0217	0.19	Q	.	.	.	.
1.62	0.0235	0.19	Q	.	.	.	.
1.73	0.0254	0.19	Q	.	.	.	.
1.85	0.0272	0.19	Q	.	.	.	.
1.96	0.0291	0.20	Q	.	.	.	.
2.08	0.0309	0.20	Q	.	.	.	.
2.20	0.0328	0.20	Q	.	.	.	.
2.31	0.0347	0.20	Q	.	.	.	.
2.43	0.0367	0.20	Q	.	.	.	.
2.54	0.0386	0.20	Q	.	.	.	.
2.66	0.0405	0.20	Q	.	.	.	.
2.78	0.0425	0.20	Q	.	.	.	.
2.89	0.0445	0.21	Q	.	.	.	.
3.01	0.0465	0.21	Q	.	.	.	.
3.12	0.0485	0.21	Q	.	.	.	.
3.24	0.0505	0.21	Q	.	.	.	.
3.36	0.0525	0.21	Q	.	.	.	.
3.47	0.0546	0.21	Q	.	.	.	.
3.59	0.0566	0.22	Q	.	.	.	.
3.70	0.0587	0.22	Q	.	.	.	.
3.82	0.0608	0.22	Q	.	.	.	.
3.94	0.0629	0.22	Q	.	.	.	.
4.05	0.0651	0.22	Q	.	.	.	.
4.17	0.0672	0.23	Q	.	.	.	.
4.28	0.0694	0.23	Q	.	.	.	.
4.40	0.0716	0.23	Q	.	.	.	.
4.52	0.0738	0.23	Q	.	.	.	.
4.63	0.0760	0.23	Q	.	.	.	.
4.75	0.0782	0.24	Q	.	.	.	.
4.86	0.0805	0.24	Q	.	.	.	.
4.98	0.0828	0.24	Q	.	.	.	.
5.10	0.0851	0.24	Q	.	.	.	.
5.21	0.0874	0.24	Q	.	.	.	.
5.33	0.0898	0.24	Q	.	.	.	.
5.44	0.0921	0.25	Q	.	.	.	.
5.56	0.0945	0.25	Q	.	.	.	.
5.68	0.0969	0.25	Q	.	.	.	.
5.79	0.0993	0.25	Q	.	.	.	.
5.91	0.1018	0.26	Q	.	.	.	.
6.02	0.1043	0.26	Q	.	.	.	.
6.14	0.1068	0.26	Q	.	.	.	.
6.26	0.1093	0.26	Q	.	.	.	.
6.37	0.1118	0.27	Q	.	.	.	.
6.49	0.1144	0.27	Q	.	.	.	.
6.60	0.1170	0.27	Q	.	.	.	.
6.72	0.1196	0.27	Q	.	.	.	.
6.84	0.1222	0.28	Q	.	.	.	.
6.95	0.1249	0.28	Q	.	.	.	.
7.07	0.1276	0.28	Q	.	.	.	.
7.18	0.1303	0.29	Q	.	.	.	.
7.30	0.1331	0.29	Q	.	.	.	.
7.42	0.1359	0.29	Q	.	.	.	.
7.53	0.1387	0.30	Q	.	.	.	.
7.65	0.1415	0.30	Q	.	.	.	.
7.76	0.1444	0.30	Q	.	.	.	.
7.88	0.1473	0.30	Q	.	.	.	.
8.00	0.1503	0.31	Q	.	.	.	.
8.11	0.1532	0.31	Q	.	.	.	.
8.23	0.1562	0.32	Q	.	.	.	.
8.34	0.1593	0.32	Q	.	.	.	.

8.46	0.1624	0.32	Q	.	.	.	.
8.58	0.1655	0.33	Q	.	.	.	.
8.69	0.1686	0.33	Q	.	.	.	.
8.81	0.1718	0.33	Q	.	.	.	.
8.92	0.1751	0.34	Q	.	.	.	.
9.04	0.1783	0.34	Q	.	.	.	.
9.16	0.1816	0.35	Q	.	.	.	.
9.27	0.1850	0.35	Q	.	.	.	.
9.39	0.1884	0.36	Q	.	.	.	.
9.50	0.1918	0.36	Q	.	.	.	.
9.62	0.1953	0.37	Q	.	.	.	.
9.74	0.1989	0.37	Q	.	.	.	.
9.85	0.2025	0.38	Q	.	.	.	.
9.97	0.2061	0.38	Q	.	.	.	.
10.08	0.2098	0.39	Q	.	.	.	.
10.20	0.2135	0.39	Q	.	.	.	.
10.32	0.2173	0.40	Q	.	.	.	.
10.43	0.2212	0.40	Q	.	.	.	.
10.55	0.2251	0.41	Q	.	.	.	.
10.66	0.2291	0.42	Q	.	.	.	.
10.78	0.2331	0.43	Q	.	.	.	.
10.90	0.2373	0.43	Q	.	.	.	.
11.01	0.2414	0.44	Q	.	.	.	.
11.13	0.2457	0.45	Q	.	.	.	.
11.24	0.2500	0.46	Q	.	.	.	.
11.36	0.2544	0.46	Q	.	.	.	.
11.48	0.2589	0.47	Q	.	.	.	.
11.59	0.2635	0.48	Q	.	.	.	.
11.71	0.2681	0.49	Q	.	.	.	.
11.82	0.2729	0.50	Q	.	.	.	.
11.94	0.2777	0.51	.Q	.	.	.	.
12.06	0.2826	0.52	.Q	.	.	.	.
12.17	0.2886	0.73	.Q	.	.	.	.
12.29	0.2956	0.74	.Q	.	.	.	.
12.40	0.3028	0.75	.Q	.	.	.	.
12.52	0.3100	0.76	.Q	.	.	.	.
12.64	0.3174	0.78	.Q	.	.	.	.
12.75	0.3250	0.79	.Q	.	.	.	.
12.87	0.3327	0.81	.Q	.	.	.	.
12.98	0.3405	0.82	.Q	.	.	.	.
13.10	0.3485	0.85	.Q	.	.	.	.
13.22	0.3567	0.86	.Q	.	.	.	.
13.33	0.3651	0.89	.Q	.	.	.	.
13.45	0.3737	0.90	.Q	.	.	.	.
13.56	0.3825	0.93	.Q	.	.	.	.
13.68	0.3915	0.95	.Q	.	.	.	.
13.80	0.4007	0.98	.Q	.	.	.	.
13.91	0.4103	1.00	. Q	.	.	.	.
14.03	0.4201	1.04	. Q	.	.	.	.
14.14	0.4301	1.05	. Q	.	.	.	.
14.26	0.4405	1.10	. Q	.	.	.	.
14.38	0.4512	1.13	. Q	.	.	.	.
14.49	0.4623	1.19	. Q	.	.	.	.
14.61	0.4738	1.22	. Q	.	.	.	.
14.72	0.4859	1.30	. Q	.	.	.	.
14.84	0.4985	1.34	. Q	.	.	.	.
14.96	0.5119	1.44	. Q	.	.	.	.
15.07	0.5259	1.50	. Q	.	.	.	.
15.19	0.5410	1.63	. Q	.	.	.	.
15.30	0.5570	1.72	. Q	.	.	.	.

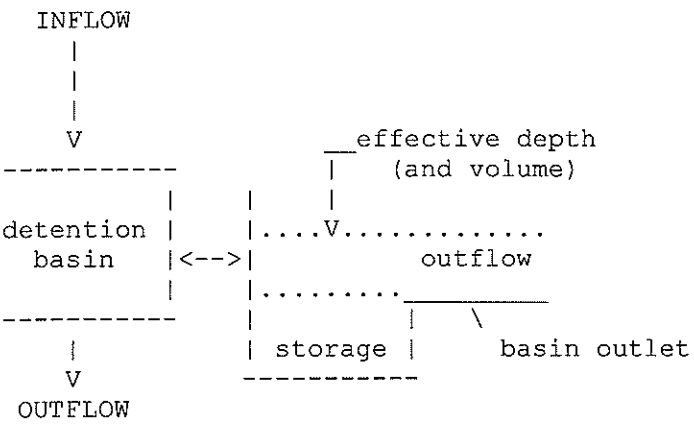
15.42	0.5736	1.74	. Q . . . .
15.54	0.5903	1.75	. Q . . . .
15.65	0.6089	2.13	. Q . . . .
15.77	0.6310	2.47	. Q . . . .
15.88	0.6604	3.68	. Q . . . .
16.00	0.7020	4.99	. Q. . . .
16.12	0.7947	14.36	. . . Q .
16.23	0.8780	3.02	. Q . . . .
16.35	0.9017	1.92	. Q . . . .
16.46	0.9196	1.82	. Q . . . .
16.58	0.9357	1.56	. Q . . . .
16.70	0.9499	1.39	. Q . . . .
16.81	0.9626	1.26	. Q . . . .
16.93	0.9741	1.16	. Q . . . .
17.04	0.9849	1.08	. Q . . . .
17.16	0.9949	1.02	. Q . . . .
17.28	1.0045	0.97	.Q . . . .
17.39	1.0135	0.92	:Q . . . .
17.51	1.0221	0.87	.Q . . . .
17.62	1.0303	0.84	.Q . . . .
17.74	1.0381	0.80	.Q . . . .
17.86	1.0456	0.77	.Q . . . .
17.97	1.0529	0.74	.Q . . . .
18.09	1.0597	0.67	.Q . . . .
18.20	1.0653	0.50	.Q . . . .
18.32	1.0700	0.49	Q . . . .
18.44	1.0746	0.47	Q . . . .
18.55	1.0790	0.45	Q . . . .
18.67	1.0833	0.44	Q . . . .
18.78	1.0874	0.42	Q . . . .
18.90	1.0913	0.41	Q . . . .
19.02	1.0952	0.40	Q . . . .
19.13	1.0990	0.39	Q . . . .
19.25	1.1026	0.37	Q . . . .
19.36	1.1061	0.36	Q . . . .
19.48	1.1096	0.35	Q . . . .
19.60	1.1129	0.35	Q . . . .
19.71	1.1162	0.34	Q . . . .
19.83	1.1194	0.33	Q . . . .
19.94	1.1225	0.32	Q . . . .
20.06	1.1256	0.31	Q . . . .
20.18	1.1285	0.31	Q . . . .
20.29	1.1314	0.30	Q . . . .
20.41	1.1343	0.29	Q . . . .
20.52	1.1371	0.29	Q . . . .
20.64	1.1398	0.28	Q . . . .
20.76	1.1425	0.28	Q . . . .
20.87	1.1451	0.27	Q . . . .
20.99	1.1477	0.27	Q . . . .
21.10	1.1502	0.26	Q . . . .
21.22	1.1527	0.26	Q . . . .
21.34	1.1551	0.25	Q . . . .
21.45	1.1575	0.25	Q . . . .
21.57	1.1598	0.24	Q . . . .
21.68	1.1621	0.24	Q . . . .
21.80	1.1644	0.23	Q . . . .
21.92	1.1666	0.23	Q . . . .
22.03	1.1688	0.23	Q . . . .
22.15	1.1709	0.22	Q . . . .
22.26	1.1730	0.22	Q . . . .

22.38	1.1751	0.22	Q	.	.	.	.
22.50	1.1772	0.21	Q	.	.	.	.
22.61	1.1792	0.21	Q	.	.	.	.
22.73	1.1812	0.21	Q	.	.	.	.
22.84	1.1831	0.20	Q	.	.	.	.
22.96	1.1851	0.20	Q	.	.	.	.
23.08	1.1870	0.20	Q	.	.	.	.
23.19	1.1889	0.19	Q	.	.	.	.
23.31	1.1907	0.19	Q	.	.	.	.
23.42	1.1925	0.19	Q	.	.	.	.
23.54	1.1943	0.19	Q	.	.	.	.
23.66	1.1961	0.18	Q	.	.	.	.
23.77	1.1978	0.18	Q	.	.	.	.
23.89	1.1996	0.18	Q	.	.	.	.
24.00	1.2013	0.18	Q	.	.	.	.
24.12	1.2021	0.00	Q	.	.	.	.

Problem Descriptions:
25-YEAR FREQUENCY
ON-SITE DETENTION SYSTEM
SOUTH SHORES CHURCH, DANA POINT

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 6.960
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 14

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	*
0.000	0.000	0.000	**	0.750	0.055	2.740	*
1.000	0.073	3.530	**	1.500	0.110	4.730	*
2.000	0.147	5.680	**	2.500	0.184	6.490	*
3.000	0.220	7.220	**	3.500	0.257	7.870	*
4.000	0.294	8.480	**	4.500	0.331	9.040	*

*	5.000	0.367	9.570**	5.500	0.404	10.080*
*	6.000	0.441	10.560**	6.500	0.478	11.020*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.75	0.04187	0.06813
3	1.00	0.05608	0.08992
4	1.50	0.08733	0.13267
5	2.00	0.11977	0.17423
6	2.50	0.15289	0.21511
7	3.00	0.18539	0.25461
8	3.50	0.21928	0.29472
9	4.00	0.25335	0.33465
10	4.50	0.28767	0.37433
11	5.00	0.32113	0.41287
12	5.50	0.35568	0.45232
13	6.00	0.39038	0.49162
14	6.50	0.42518	0.53082

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.108	0.000	0.17	0.02	0.03	0.001
0.224	0.000	0.18	0.03	0.09	0.002
0.340	0.000	0.18	0.04	0.12	0.003
0.456	0.000	0.18	0.04	0.14	0.003
0.572	0.000	0.18	0.04	0.16	0.003
0.688	0.000	0.18	0.05	0.17	0.003
0.804	0.000	0.18	0.05	0.17	0.003
0.920	0.000	0.18	0.05	0.18	0.004
1.036	0.000	0.18	0.05	0.18	0.004
1.152	0.000	0.19	0.05	0.18	0.004
1.268	0.000	0.19	0.05	0.18	0.004
1.384	0.000	0.19	0.05	0.18	0.004
1.500	0.000	0.19	0.05	0.19	0.004
1.616	0.000	0.19	0.05	0.19	0.004
1.732	0.000	0.19	0.05	0.19	0.004
1.848	0.000	0.19	0.05	0.19	0.004
1.964	0.000	0.20	0.05	0.19	0.004
2.080	0.000	0.20	0.05	0.19	0.004
2.196	0.000	0.20	0.05	0.19	0.004
2.312	0.000	0.20	0.05	0.20	0.004
2.428	0.000	0.20	0.05	0.20	0.004
2.544	0.000	0.20	0.05	0.20	0.004
2.660	0.000	0.20	0.06	0.20	0.004
2.776	0.000	0.20	0.06	0.20	0.004
2.892	0.000	0.21	0.06	0.20	0.004
3.008	0.000	0.21	0.06	0.21	0.004
3.124	0.000	0.21	0.06	0.21	0.004
3.240	0.000	0.21	0.06	0.21	0.004
3.356	0.000	0.21	0.06	0.21	0.004
3.472	0.000	0.21	0.06	0.21	0.004

3.588	0.000	0.22	0.06	0.21	0.004
3.704	0.000	0.22	0.06	0.21	0.004
3.820	0.000	0.22	0.06	0.22	0.004
3.936	0.000	0.22	0.06	0.22	0.004
4.052	0.000	0.22	0.06	0.22	0.004
4.168	0.000	0.23	0.06	0.22	0.004
4.284	0.000	0.23	0.06	0.22	0.005
4.400	0.000	0.23	0.06	0.23	0.005
4.516	0.000	0.23	0.06	0.23	0.005
4.632	0.000	0.23	0.06	0.23	0.005
4.748	0.000	0.24	0.06	0.23	0.005
4.864	0.000	0.24	0.06	0.23	0.005
4.980	0.000	0.24	0.06	0.23	0.005
5.096	0.000	0.24	0.07	0.24	0.005
5.212	0.000	0.24	0.07	0.24	0.005
5.328	0.000	0.24	0.07	0.24	0.005
5.444	0.000	0.25	0.07	0.24	0.005
5.560	0.000	0.25	0.07	0.25	0.005
5.676	0.000	0.25	0.07	0.25	0.005
5.792	0.000	0.25	0.07	0.25	0.005
5.908	0.000	0.26	0.07	0.25	0.005
6.024	0.000	0.26	0.07	0.25	0.005
6.140	0.000	0.26	0.07	0.26	0.005
6.256	0.000	0.26	0.07	0.26	0.005
6.372	0.000	0.27	0.07	0.26	0.005
6.488	0.000	0.27	0.07	0.26	0.005
6.604	0.000	0.27	0.07	0.27	0.005
6.720	0.000	0.27	0.07	0.27	0.005
6.836	0.000	0.28	0.07	0.27	0.005
6.952	0.000	0.28	0.08	0.27	0.006
7.068	0.000	0.28	0.08	0.28	0.006
7.184	0.000	0.29	0.08	0.28	0.006
7.300	0.000	0.29	0.08	0.28	0.006
7.416	0.000	0.29	0.08	0.29	0.006
7.532	0.000	0.30	0.08	0.29	0.006
7.648	0.000	0.30	0.08	0.29	0.006
7.764	0.000	0.30	0.08	0.30	0.006
7.880	0.000	0.30	0.08	0.30	0.006
7.996	0.000	0.31	0.08	0.30	0.006
8.112	0.000	0.31	0.08	0.30	0.006
8.228	0.000	0.32	0.08	0.31	0.006
8.344	0.000	0.32	0.09	0.31	0.006
8.460	0.000	0.32	0.09	0.32	0.006
8.576	0.000	0.33	0.09	0.32	0.006
8.692	0.000	0.33	0.09	0.32	0.007
8.808	0.000	0.33	0.09	0.33	0.007
8.924	0.000	0.34	0.09	0.33	0.007
9.040	0.000	0.34	0.09	0.33	0.007
9.156	0.000	0.35	0.09	0.34	0.007
9.272	0.000	0.35	0.09	0.34	0.007
9.388	0.000	0.36	0.10	0.35	0.007
9.504	0.000	0.36	0.10	0.35	0.007
9.620	0.000	0.37	0.10	0.36	0.007
9.736	0.000	0.37	0.10	0.36	0.007
9.852	0.000	0.38	0.10	0.37	0.007
9.968	0.000	0.38	0.10	0.37	0.008
10.084	0.000	0.39	0.10	0.38	0.008
10.200	0.000	0.39	0.11	0.38	0.008
10.316	0.000	0.40	0.11	0.39	0.008
10.432	0.000	0.40	0.11	0.39	0.008

10.548	0.000	0.41	0.11	0.40	0.008
10.664	0.000	0.42	0.11	0.41	0.008
10.780	0.000	0.43	0.11	0.41	0.008
10.896	0.000	0.43	0.12	0.42	0.008
11.012	0.000	0.44	0.12	0.43	0.009
11.128	0.000	0.45	0.12	0.43	0.009
11.244	0.000	0.46	0.12	0.44	0.009
11.360	0.000	0.46	0.12	0.45	0.009
11.476	0.000	0.47	0.13	0.46	0.009
11.592	0.000	0.48	0.13	0.46	0.009
11.708	0.000	0.49	0.13	0.47	0.010
11.824	0.000	0.50	0.13	0.48	0.010
11.940	0.000	0.51	0.14	0.49	0.010
12.056	0.000	0.52	0.14	0.50	0.010
12.172	0.000	0.73	0.16	0.55	0.012
12.288	0.000	0.74	0.18	0.62	0.013
12.404	0.000	0.75	0.19	0.67	0.014
12.520	0.000	0.76	0.20	0.70	0.014
12.636	0.000	0.78	0.20	0.73	0.015
12.752	0.000	0.79	0.21	0.75	0.015
12.868	0.000	0.81	0.21	0.77	0.016
12.984	0.000	0.82	0.22	0.79	0.016
13.100	0.000	0.85	0.22	0.81	0.016
13.216	0.000	0.86	0.23	0.83	0.017
13.332	0.000	0.89	0.23	0.84	0.017
13.448	0.000	0.90	0.24	0.86	0.018
13.564	0.000	0.93	0.25	0.88	0.018
13.680	0.000	0.95	0.25	0.91	0.018
13.796	0.000	0.98	0.26	0.93	0.019
13.912	0.000	1.00	0.26	0.95	0.019
14.028	0.000	1.04	0.27	0.98	0.020
14.144	0.000	1.05	0.28	1.01	0.020
14.260	0.000	1.10	0.29	1.03	0.021
14.376	0.000	1.13	0.30	1.07	0.022
14.492	0.000	1.19	0.31	1.10	0.023
14.608	0.000	1.22	0.32	1.14	0.023
14.724	0.000	1.30	0.33	1.19	0.024
14.840	0.000	1.34	0.35	1.24	0.025
14.956	0.000	1.44	0.36	1.30	0.027
15.072	0.000	1.50	0.38	1.36	0.028
15.188	0.000	1.63	0.41	1.44	0.030
15.304	0.000	1.72	0.43	1.53	0.032
15.420	0.000	1.74	0.45	1.61	0.033
15.536	0.000	1.75	0.46	1.66	0.034
15.652	0.000	2.13	0.51	1.77	0.037
15.768	0.000	2.47	0.57	1.97	0.042
15.884	0.000	3.68	0.74	2.40	0.054
16.000	0.000	4.99	0.99	3.10	0.072
16.116	0.000	14.36	2.23	4.78	0.164
16.232	0.000	3.02	1.88	5.75	0.138
16.348	0.000	1.92	1.47	5.06	0.108
16.464	0.000	1.82	1.15	4.28	0.084
16.580	0.000	1.56	0.89	3.54	0.065
16.696	0.000	1.39	0.70	2.87	0.051
16.812	0.000	1.26	0.56	2.30	0.041
16.928	0.000	1.16	0.47	1.88	0.034
17.044	0.000	1.08	0.40	1.58	0.029
17.160	0.000	1.02	0.35	1.38	0.026
17.276	0.000	0.97	0.32	1.23	0.023
17.392	0.000	0.92	0.29	1.12	0.021

17.508	0.000	0.87	0.27	1.03	0.020
17.624	0.000	0.84	0.26	0.96	0.019
17.740	0.000	0.80	0.24	0.91	0.018
17.856	0.000	0.77	0.23	0.86	0.017
17.972	0.000	0.74	0.22	0.82	0.016
18.088	0.000	0.67	0.21	0.78	0.015
18.204	0.000	0.50	0.18	0.70	0.013
18.320	0.000	0.49	0.16	0.62	0.012
18.436	0.000	0.47	0.15	0.57	0.011
18.552	0.000	0.45	0.14	0.53	0.010
18.668	0.000	0.44	0.13	0.49	0.010
18.784	0.000	0.42	0.13	0.47	0.009
18.900	0.000	0.41	0.12	0.45	0.009
19.016	0.000	0.40	0.12	0.43	0.008
19.132	0.000	0.39	0.11	0.42	0.008
19.248	0.000	0.37	0.11	0.40	0.008
19.364	0.000	0.36	0.10	0.39	0.008
19.480	0.000	0.35	0.10	0.38	0.007
19.596	0.000	0.35	0.10	0.37	0.007
19.712	0.000	0.34	0.10	0.36	0.007
19.828	0.000	0.33	0.09	0.35	0.007
19.944	0.000	0.32	0.09	0.34	0.007
20.060	0.000	0.31	0.09	0.33	0.007
20.176	0.000	0.31	0.09	0.32	0.006
20.292	0.000	0.30	0.09	0.32	0.006
20.408	0.000	0.29	0.08	0.31	0.006
20.524	0.000	0.29	0.08	0.30	0.006
20.640	0.000	0.28	0.08	0.29	0.006
20.756	0.000	0.28	0.08	0.29	0.006
20.872	0.000	0.27	0.08	0.28	0.006
20.988	0.000	0.27	0.08	0.28	0.006
21.104	0.000	0.26	0.07	0.27	0.005
21.220	0.000	0.26	0.07	0.27	0.005
21.336	0.000	0.25	0.07	0.26	0.005
21.452	0.000	0.25	0.07	0.26	0.005
21.568	0.000	0.24	0.07	0.25	0.005
21.684	0.000	0.24	0.07	0.25	0.005
21.800	0.000	0.23	0.07	0.24	0.005
21.916	0.000	0.23	0.06	0.24	0.005
22.032	0.000	0.23	0.06	0.23	0.005
22.148	0.000	0.22	0.06	0.23	0.005
22.264	0.000	0.22	0.06	0.23	0.005
22.380	0.000	0.22	0.06	0.22	0.004
22.496	0.000	0.21	0.06	0.22	0.004
22.612	0.000	0.21	0.06	0.22	0.004
22.728	0.000	0.21	0.06	0.21	0.004
22.844	0.000	0.20	0.06	0.21	0.004
22.960	0.000	0.20	0.06	0.21	0.004
23.076	0.000	0.20	0.06	0.20	0.004
23.192	0.000	0.19	0.05	0.20	0.004
23.308	0.000	0.19	0.05	0.20	0.004
23.424	0.000	0.19	0.05	0.19	0.004
23.540	0.000	0.19	0.05	0.19	0.004
23.656	0.000	0.18	0.05	0.19	0.004
23.772	0.000	0.18	0.05	0.19	0.004
23.888	0.000	0.18	0.05	0.18	0.004
24.004	0.000	0.18	0.05	0.18	0.004
24.120	0.000	0.00	0.03	0.15	0.002

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SMALL AREA UNIT HYDROGRAPH MODEL

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Ver. 15.0 Release Date: 04/01/2008 License ID 1204

Analysis prepared by:

Adams-Streeter Civil Engineers, Inc.
15 Corporate Park
Irvine, CA 92606
949-474-2330

****

Problem Descriptions:
100-YEAR FREQUENCY
HYDROGRAPH
SOUTH SHORES CHURCH, DANA POINT

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
TOTAL CATCHMENT AREA(ACRES) = 4.06
SOIL-LOSS RATE, Fm,(INCH/HR) = 0.020
LOW LOSS FRACTION = 0.180
TIME OF CONCENTRATION(MIN.) = 6.96
SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
RETURN FREQUENCY(YEARS) = 100
5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.52
30-MINUTE POINT RAINFALL VALUE(INCHES) = 1.09
1-HOUR POINT RAINFALL VALUE(INCHES) = 1.45
3-HOUR POINT RAINFALL VALUE(INCHES) = 2.43
6-HOUR POINT RAINFALL VALUE(INCHES) = 3.36
24-HOUR POINT RAINFALL VALUE(INCHES) = 5.63

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 1.56
TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.34

****

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	5.0	10.0	15.0	20.0
0.11	0.0012	0.26	Q	.	.	.	.
0.22	0.0037	0.26	Q	.	.	.	.
0.34	0.0062	0.26	Q	.	.	.	.
0.46	0.0088	0.27	Q	.	.	.	.
0.57	0.0113	0.27	Q	.	.	.	.
0.69	0.0139	0.27	Q	.	.	.	.
0.80	0.0164	0.27	Q	.	.	.	.
0.92	0.0190	0.27	Q	.	.	.	.
1.04	0.0216	0.27	Q	.	.	.	.
1.15	0.0242	0.27	Q	.	.	.	.
1.27	0.0269	0.27	Q	.	.	.	.
1.38	0.0295	0.28	Q	.	.	.	.

1.50	0.0322	0.28	Q	.	.	.	.
1.62	0.0348	0.28	Q	.	.	.	.
1.73	0.0375	0.28	Q	.	.	.	.
1.85	0.0402	0.28	Q	.	.	.	.
1.96	0.0429	0.28	Q	.	.	.	.
2.08	0.0456	0.28	Q	.	.	.	.
2.20	0.0483	0.29	Q	.	.	.	.
2.31	0.0511	0.29	Q	.	.	.	.
2.43	0.0539	0.29	Q	.	.	.	.
2.54	0.0566	0.29	Q	.	.	.	.
2.66	0.0594	0.29	Q	.	.	.	.
2.78	0.0622	0.29	Q	.	.	.	.
2.89	0.0651	0.30	Q	.	.	.	.
3.01	0.0679	0.30	Q	.	.	.	.
3.12	0.0707	0.30	Q	.	.	.	.
3.24	0.0736	0.30	Q	.	.	.	.
3.36	0.0765	0.30	Q	.	.	.	.
3.47	0.0794	0.30	Q	.	.	.	.
3.59	0.0823	0.31	Q	.	.	.	.
3.70	0.0853	0.31	Q	.	.	.	.
3.82	0.0882	0.31	Q	.	.	.	.
3.94	0.0912	0.31	Q	.	.	.	.
4.05	0.0942	0.31	Q	.	.	.	.
4.17	0.0972	0.31	Q	.	.	.	.
4.28	0.1002	0.32	Q	.	.	.	.
4.40	0.1033	0.32	Q	.	.	.	.
4.52	0.1063	0.32	Q	.	.	.	.
4.63	0.1094	0.32	Q	.	.	.	.
4.75	0.1125	0.33	Q	.	.	.	.
4.86	0.1156	0.33	Q	.	.	.	.
4.98	0.1188	0.33	Q	.	.	.	.
5.10	0.1219	0.33	Q	.	.	.	.
5.21	0.1251	0.33	Q	.	.	.	.
5.33	0.1283	0.34	Q	.	.	.	.
5.44	0.1316	0.34	Q	.	.	.	.
5.56	0.1348	0.34	Q	.	.	.	.
5.68	0.1381	0.35	Q	.	.	.	.
5.79	0.1414	0.35	Q	.	.	.	.
5.91	0.1448	0.35	Q	.	.	.	.
6.02	0.1482	0.35	Q	.	.	.	.
6.14	0.1516	0.36	Q	.	.	.	.
6.26	0.1550	0.36	Q	.	.	.	.
6.37	0.1585	0.36	Q	.	.	.	.
6.49	0.1620	0.37	Q	.	.	.	.
6.60	0.1655	0.37	Q	.	.	.	.
6.72	0.1691	0.37	Q	.	.	.	.
6.84	0.1726	0.38	Q	.	.	.	.
6.95	0.1763	0.38	Q	.	.	.	.
7.07	0.1799	0.38	Q	.	.	.	.
7.18	0.1836	0.39	Q	.	.	.	.
7.30	0.1874	0.39	Q	.	.	.	.
7.42	0.1911	0.39	Q	.	.	.	.
7.53	0.1950	0.40	Q	.	.	.	.
7.65	0.1988	0.40	Q	.	.	.	.
7.76	0.2027	0.41	Q	.	.	.	.
7.88	0.2066	0.41	Q	.	.	.	.
8.00	0.2106	0.42	Q	.	.	.	.
8.11	0.2146	0.42	Q	.	.	.	.
8.23	0.2187	0.43	Q	.	.	.	.
8.34	0.2228	0.43	Q	.	.	.	.

8.46	0.2269	0.44	Q	.	.	.	.
8.58	0.2311	0.44	Q	.	.	.	.
8.69	0.2353	0.45	Q	.	.	.	.
8.81	0.2396	0.45	Q	.	.	.	.
8.92	0.2439	0.46	Q	.	.	.	.
9.04	0.2483	0.46	Q	.	.	.	.
9.16	0.2528	0.47	Q	.	.	.	.
9.27	0.2573	0.47	Q	.	.	.	.
9.39	0.2618	0.48	Q	.	.	.	.
9.50	0.2664	0.48	Q	.	.	.	.
9.62	0.2711	0.49	Q	.	.	.	.
9.74	0.2758	0.50	Q	.	.	.	.
9.85	0.2806	0.50	.Q	.	.	.	.
9.97	0.2855	0.51	.Q	.	.	.	.
10.08	0.2904	0.52	.Q	.	.	.	.
10.20	0.2954	0.52	.Q	.	.	.	.
10.32	0.3004	0.53	.Q	.	.	.	.
10.43	0.3056	0.54	.Q	.	.	.	.
10.55	0.3108	0.55	.Q	.	.	.	.
10.66	0.3161	0.55	.Q	.	.	.	.
10.78	0.3214	0.57	.Q	.	.	.	.
10.90	0.3269	0.57	.Q	.	.	.	.
11.01	0.3324	0.58	.Q	.	.	.	.
11.13	0.3381	0.59	.Q	.	.	.	.
11.24	0.3438	0.60	.Q	.	.	.	.
11.36	0.3496	0.61	.Q	.	.	.	.
11.48	0.3555	0.62	.Q	.	.	.	.
11.59	0.3615	0.63	.Q	.	.	.	.
11.71	0.3677	0.65	.Q	.	.	.	.
11.82	0.3739	0.66	.Q	.	.	.	.
11.94	0.3803	0.67	.Q	.	.	.	.
12.06	0.3868	0.68	.Q	.	.	.	.
12.17	0.3944	0.90	.Q	.	.	.	.
12.29	0.4030	0.91	.Q	.	.	.	.
12.40	0.4118	0.93	.Q	.	.	.	.
12.52	0.4207	0.94	.Q	.	.	.	.
12.64	0.4299	0.96	.Q	.	.	.	.
12.75	0.4391	0.98	.Q	.	.	.	.
12.87	0.4486	1.00	. Q	.	.	.	.
12.98	0.4583	1.02	. Q	.	.	.	.
13.10	0.4682	1.05	. Q	.	.	.	.
13.22	0.4783	1.06	. Q	.	.	.	.
13.33	0.4887	1.10	. Q	.	.	.	.
13.45	0.4992	1.11	. Q	.	.	.	.
13.56	0.5101	1.15	. Q	.	.	.	.
13.68	0.5213	1.17	. Q	.	.	.	.
13.80	0.5327	1.22	. Q	.	.	.	.
13.91	0.5445	1.24	. Q	.	.	.	.
14.03	0.5566	1.29	. Q	.	.	.	.
14.14	0.5692	1.33	. Q	.	.	.	.
14.26	0.5822	1.39	. Q	.	.	.	.
14.38	0.5957	1.42	. Q	.	.	.	.
14.49	0.6097	1.50	. Q	.	.	.	.
14.61	0.6243	1.54	. Q	.	.	.	.
14.72	0.6396	1.64	. Q	.	.	.	.
14.84	0.6555	1.69	. Q	.	.	.	.
14.96	0.6724	1.82	. Q	.	.	.	.
15.07	0.6901	1.89	. Q	.	.	.	.
15.19	0.7091	2.06	. Q	.	.	.	.
15.30	0.7294	2.17	. Q	.	.	.	.

15.42	0.7506	2.24	. Q . . . .
15.54	0.7723	2.30	. Q . . . .
15.65	0.7966	2.77	. Q . . . .
15.77	0.8249	3.13	. Q . . . .
15.88	0.8614	4.49	. Q . . . .
16.00	0.9124	6.15	. . Q . . .
16.12	1.0316	18.70	. . . . Q .
16.23	1.1388	3.66	. Q . . . .
16.35	1.1683	2.50	. Q . . . .
16.46	1.1913	2.29	. Q . . . .
16.58	1.2118	1.97	. Q . . . .
16.70	1.2296	1.75	. Q . . . .
16.81	1.2456	1.59	. Q . . . .
16.93	1.2602	1.46	. Q . . . .
17.04	1.2737	1.36	. Q . . . .
17.16	1.2863	1.27	. Q . . . .
17.28	1.2981	1.19	. Q . . . .
17.39	1.3093	1.13	. Q . . . .
17.51	1.3199	1.08	. Q . . . .
17.62	1.3300	1.03	. Q . . . .
17.74	1.3397	0.99	.Q . . . .
17.86	1.3490	0.95	.Q . . . .
17.97	1.3579	0.92	.Q . . . .
18.09	1.3663	0.83	.Q . . . .
18.20	1.3735	0.66	.Q . . . .
18.32	1.3797	0.64	.Q . . . .
18.44	1.3858	0.62	.Q . . . .
18.55	1.3916	0.60	.Q . . . .
18.67	1.3972	0.58	.Q . . . .
18.78	1.4027	0.56	.Q . . . .
18.90	1.4080	0.54	.Q . . . .
19.02	1.4131	0.53	.Q . . . .
19.13	1.4181	0.51	.Q . . . .
19.25	1.4229	0.50	Q . . . .
19.36	1.4277	0.49	Q . . . .
19.48	1.4323	0.47	Q . . . .
19.60	1.4368	0.46	Q . . . .
19.71	1.4412	0.45	Q . . . .
19.83	1.4454	0.44	Q . . . .
19.94	1.4496	0.43	Q . . . .
20.06	1.4537	0.42	Q . . . .
20.18	1.4577	0.41	Q . . . .
20.29	1.4617	0.41	Q . . . .
20.41	1.4655	0.40	Q . . . .
20.52	1.4693	0.39	Q . . . .
20.64	1.4730	0.38	Q . . . .
20.76	1.4766	0.37	Q . . . .
20.87	1.4802	0.37	Q . . . .
20.99	1.4837	0.36	Q . . . .
21.10	1.4871	0.36	Q . . . .
21.22	1.4905	0.35	Q . . . .
21.34	1.4938	0.34	Q . . . .
21.45	1.4971	0.34	Q . . . .
21.57	1.5003	0.33	Q . . . .
21.68	1.5034	0.33	Q . . . .
21.80	1.5066	0.32	Q . . . .
21.92	1.5097	0.32	Q . . . .
22.03	1.5127	0.32	Q . . . .
22.15	1.5157	0.31	Q . . . .
22.26	1.5187	0.31	Q . . . .

22.38	1.5216	0.30	Q	.	.	.	.
22.50	1.5245	0.30	Q	.	.	.	.
22.61	1.5274	0.30	Q	.	.	.	.
22.73	1.5302	0.29	Q	.	.	.	.
22.84	1.5330	0.29	Q	.	.	.	.
22.96	1.5358	0.29	Q	.	.	.	.
23.08	1.5386	0.29	Q	.	.	.	.
23.19	1.5413	0.28	Q	.	.	.	.
23.31	1.5440	0.28	Q	.	.	.	.
23.42	1.5466	0.28	Q	.	.	.	.
23.54	1.5493	0.27	Q	.	.	.	.
23.66	1.5519	0.27	Q	.	.	.	.
23.77	1.5545	0.27	Q	.	.	.	.
23.89	1.5570	0.27	Q	.	.	.	.
24.00	1.5596	0.26	Q	.	.	.	.
24.12	1.5608	0.00	Q	.	.	.	.

Problem Descriptions:
100-YEAR FREQUENCY
ON-SITE DETENTION SYSTEM
SOUTH SHORES CHURCH, DANA POINT

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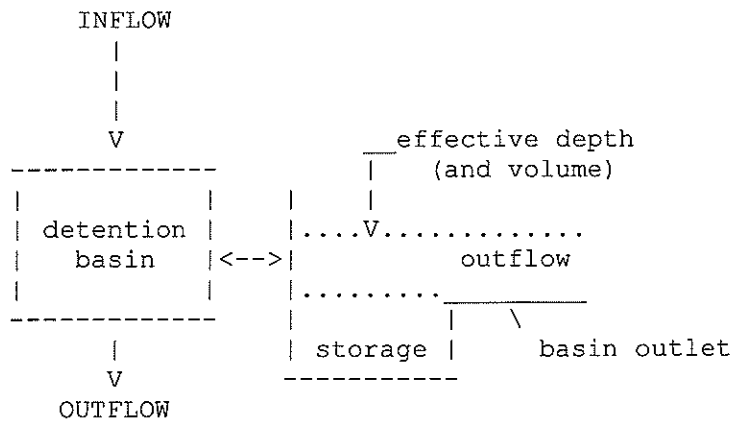
FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 6.960
DEAD STORAGE(AF) = 0.00
SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 14

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) **	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) *
* 0.000	0.000	0.000**	0.750	0.055	2.740*
* 1.000	0.073	3.530**	1.500	0.110	4.730*
* 2.000	0.147	5.680**	2.500	0.184	6.490*
* 3.000	0.220	7.220**	3.500	0.257	7.870*
* 4.000	0.294	8.480**	4.500	0.331	9.040*

*	5.000	0.367	9.570**	5.500	0.404	10.080*
*	6.000	0.441	10.560**	6.500	0.478	11.020*

BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:

INTERVAL NUMBER	DEPTH (FEET)	{S-O*DT/2} (ACRE-FEET)	{S+O*DT/2} (ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.75	0.04187	0.06813
3	1.00	0.05608	0.08992
4	1.50	0.08733	0.13267
5	2.00	0.11977	0.17423
6	2.50	0.15289	0.21511
7	3.00	0.18539	0.25461
8	3.50	0.21928	0.29472
9	4.00	0.25335	0.33465
10	4.50	0.28767	0.37433
11	5.00	0.32113	0.41287
12	5.50	0.35568	0.45232
13	6.00	0.39038	0.49162
14	6.50	0.42518	0.53082

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.108	0.000	0.26	0.03	0.05	0.002
0.224	0.000	0.26	0.04	0.13	0.003
0.340	0.000	0.26	0.06	0.18	0.004
0.456	0.000	0.27	0.06	0.21	0.005
0.572	0.000	0.27	0.07	0.23	0.005
0.688	0.000	0.27	0.07	0.25	0.005
0.804	0.000	0.27	0.07	0.26	0.005
0.920	0.000	0.27	0.07	0.26	0.005
1.036	0.000	0.27	0.07	0.26	0.005
1.152	0.000	0.27	0.07	0.27	0.005
1.268	0.000	0.27	0.07	0.27	0.005
1.384	0.000	0.28	0.07	0.27	0.005
1.500	0.000	0.28	0.08	0.27	0.006
1.616	0.000	0.28	0.08	0.28	0.006
1.732	0.000	0.28	0.08	0.28	0.006
1.848	0.000	0.28	0.08	0.28	0.006
1.964	0.000	0.28	0.08	0.28	0.006
2.080	0.000	0.28	0.08	0.28	0.006
2.196	0.000	0.29	0.08	0.28	0.006
2.312	0.000	0.29	0.08	0.28	0.006
2.428	0.000	0.29	0.08	0.29	0.006
2.544	0.000	0.29	0.08	0.29	0.006
2.660	0.000	0.29	0.08	0.29	0.006
2.776	0.000	0.29	0.08	0.29	0.006
2.892	0.000	0.30	0.08	0.29	0.006
3.008	0.000	0.30	0.08	0.29	0.006
3.124	0.000	0.30	0.08	0.30	0.006
3.240	0.000	0.30	0.08	0.30	0.006
3.356	0.000	0.30	0.08	0.30	0.006
3.472	0.000	0.30	0.08	0.30	0.006

3.588	0.000	0.31	0.08	0.30	0.006
3.704	0.000	0.31	0.08	0.30	0.006
3.820	0.000	0.31	0.08	0.31	0.006
3.936	0.000	0.31	0.08	0.31	0.006
4.052	0.000	0.31	0.08	0.31	0.006
4.168	0.000	0.31	0.09	0.31	0.006
4.284	0.000	0.32	0.09	0.31	0.006
4.400	0.000	0.32	0.09	0.31	0.006
4.516	0.000	0.32	0.09	0.32	0.006
4.632	0.000	0.32	0.09	0.32	0.006
4.748	0.000	0.33	0.09	0.32	0.006
4.864	0.000	0.33	0.09	0.32	0.006
4.980	0.000	0.33	0.09	0.32	0.007
5.096	0.000	0.33	0.09	0.33	0.007
5.212	0.000	0.33	0.09	0.33	0.007
5.328	0.000	0.34	0.09	0.33	0.007
5.444	0.000	0.34	0.09	0.33	0.007
5.560	0.000	0.34	0.09	0.34	0.007
5.676	0.000	0.35	0.09	0.34	0.007
5.792	0.000	0.35	0.09	0.34	0.007
5.908	0.000	0.35	0.09	0.34	0.007
6.024	0.000	0.35	0.10	0.35	0.007
6.140	0.000	0.36	0.10	0.35	0.007
6.256	0.000	0.36	0.10	0.35	0.007
6.372	0.000	0.36	0.10	0.36	0.007
6.488	0.000	0.37	0.10	0.36	0.007
6.604	0.000	0.37	0.10	0.36	0.007
6.720	0.000	0.37	0.10	0.37	0.007
6.836	0.000	0.38	0.10	0.37	0.007
6.952	0.000	0.38	0.10	0.37	0.008
7.068	0.000	0.38	0.10	0.38	0.008
7.184	0.000	0.39	0.10	0.38	0.008
7.300	0.000	0.39	0.11	0.38	0.008
7.416	0.000	0.39	0.11	0.39	0.008
7.532	0.000	0.40	0.11	0.39	0.008
7.648	0.000	0.40	0.11	0.40	0.008
7.764	0.000	0.41	0.11	0.40	0.008
7.880	0.000	0.41	0.11	0.40	0.008
7.996	0.000	0.42	0.11	0.41	0.008
8.112	0.000	0.42	0.11	0.41	0.008
8.228	0.000	0.43	0.11	0.42	0.008
8.344	0.000	0.43	0.12	0.42	0.008
8.460	0.000	0.44	0.12	0.42	0.009
8.576	0.000	0.44	0.12	0.43	0.009
8.692	0.000	0.45	0.12	0.43	0.009
8.808	0.000	0.45	0.12	0.44	0.009
8.924	0.000	0.46	0.12	0.44	0.009
9.040	0.000	0.46	0.12	0.45	0.009
9.156	0.000	0.47	0.13	0.45	0.009
9.272	0.000	0.47	0.13	0.46	0.009
9.388	0.000	0.48	0.13	0.47	0.009
9.504	0.000	0.48	0.13	0.47	0.010
9.620	0.000	0.49	0.13	0.48	0.010
9.736	0.000	0.50	0.13	0.48	0.010
9.852	0.000	0.50	0.13	0.49	0.010
9.968	0.000	0.51	0.14	0.50	0.010
10.084	0.000	0.52	0.14	0.50	0.010
10.200	0.000	0.52	0.14	0.51	0.010
10.316	0.000	0.53	0.14	0.52	0.010
10.432	0.000	0.54	0.14	0.52	0.011

10.548	0.000	0.55	0.15	0.53	0.011
10.664	0.000	0.55	0.15	0.54	0.011
10.780	0.000	0.57	0.15	0.55	0.011
10.896	0.000	0.57	0.15	0.56	0.011
11.012	0.000	0.58	0.16	0.56	0.011
11.128	0.000	0.59	0.16	0.57	0.012
11.244	0.000	0.60	0.16	0.58	0.012
11.360	0.000	0.61	0.16	0.59	0.012
11.476	0.000	0.62	0.17	0.60	0.012
11.592	0.000	0.63	0.17	0.61	0.012
11.708	0.000	0.65	0.17	0.62	0.013
11.824	0.000	0.66	0.17	0.63	0.013
11.940	0.000	0.67	0.18	0.65	0.013
12.056	0.000	0.68	0.18	0.66	0.013
12.172	0.000	0.90	0.21	0.71	0.015
12.288	0.000	0.91	0.22	0.78	0.016
12.404	0.000	0.93	0.23	0.83	0.017
12.520	0.000	0.94	0.24	0.87	0.018
12.636	0.000	0.96	0.25	0.90	0.018
12.752	0.000	0.98	0.26	0.93	0.019
12.868	0.000	1.00	0.26	0.95	0.019
12.984	0.000	1.02	0.27	0.97	0.020
13.100	0.000	1.05	0.28	1.00	0.020
13.216	0.000	1.06	0.28	1.02	0.021
13.332	0.000	1.10	0.29	1.04	0.021
13.448	0.000	1.11	0.29	1.07	0.022
13.564	0.000	1.15	0.30	1.09	0.022
13.680	0.000	1.17	0.31	1.12	0.023
13.796	0.000	1.22	0.32	1.15	0.023
13.912	0.000	1.24	0.33	1.18	0.024
14.028	0.000	1.29	0.34	1.21	0.025
14.144	0.000	1.33	0.35	1.25	0.025
14.260	0.000	1.39	0.36	1.29	0.026
14.376	0.000	1.42	0.37	1.34	0.027
14.492	0.000	1.50	0.39	1.39	0.028
14.608	0.000	1.54	0.40	1.44	0.029
14.724	0.000	1.64	0.42	1.50	0.031
14.840	0.000	1.69	0.44	1.56	0.032
14.956	0.000	1.82	0.46	1.64	0.034
15.072	0.000	1.89	0.48	1.72	0.035
15.188	0.000	2.06	0.51	1.82	0.038
15.304	0.000	2.17	0.54	1.93	0.040
15.420	0.000	2.24	0.57	2.04	0.042
15.536	0.000	2.30	0.59	2.13	0.044
15.652	0.000	2.77	0.66	2.29	0.048
15.768	0.000	3.13	0.73	2.54	0.054
15.884	0.000	4.49	0.93	3.00	0.068
16.000	0.000	6.15	1.25	3.72	0.091
16.116	0.000	18.70	2.95	5.64	0.217
16.232	0.000	3.66	2.53	6.84	0.186
16.348	0.000	2.50	2.06	6.15	0.151
16.464	0.000	2.29	1.65	5.40	0.121
16.580	0.000	1.97	1.31	4.65	0.096
16.696	0.000	1.75	1.03	3.93	0.075
16.812	0.000	1.59	0.80	3.25	0.059
16.928	0.000	1.46	0.65	2.64	0.048
17.044	0.000	1.36	0.54	2.18	0.040
17.160	0.000	1.27	0.47	1.84	0.034
17.276	0.000	1.19	0.41	1.61	0.030
17.392	0.000	1.13	0.37	1.44	0.027

17.508	0.000	1.08	0.34	1.31	0.025
17.624	0.000	1.03	0.32	1.21	0.023
17.740	0.000	0.99	0.30	1.13	0.022
17.856	0.000	0.95	0.29	1.07	0.021
17.972	0.000	0.92	0.27	1.02	0.020
18.088	0.000	0.83	0.25	0.96	0.019
18.204	0.000	0.66	0.23	0.88	0.017
18.320	0.000	0.64	0.21	0.79	0.015
18.436	0.000	0.62	0.19	0.73	0.014
18.552	0.000	0.60	0.18	0.68	0.013
18.668	0.000	0.58	0.17	0.65	0.013
18.784	0.000	0.56	0.16	0.62	0.012
18.900	0.000	0.54	0.16	0.59	0.012
19.016	0.000	0.53	0.15	0.57	0.011
19.132	0.000	0.51	0.15	0.55	0.011
19.248	0.000	0.50	0.14	0.53	0.011
19.364	0.000	0.49	0.14	0.52	0.010
19.480	0.000	0.47	0.14	0.50	0.010
19.596	0.000	0.46	0.13	0.49	0.010
19.712	0.000	0.45	0.13	0.48	0.009
19.828	0.000	0.44	0.13	0.47	0.009
19.944	0.000	0.43	0.12	0.45	0.009
20.060	0.000	0.42	0.12	0.44	0.009
20.176	0.000	0.41	0.12	0.43	0.009
20.292	0.000	0.41	0.12	0.42	0.008
20.408	0.000	0.40	0.11	0.42	0.008
20.524	0.000	0.39	0.11	0.41	0.008
20.640	0.000	0.38	0.11	0.40	0.008
20.756	0.000	0.37	0.11	0.39	0.008
20.872	0.000	0.37	0.10	0.38	0.008
20.988	0.000	0.36	0.10	0.38	0.007
21.104	0.000	0.36	0.10	0.37	0.007
21.220	0.000	0.35	0.10	0.36	0.007
21.336	0.000	0.34	0.10	0.36	0.007
21.452	0.000	0.34	0.10	0.35	0.007
21.568	0.000	0.33	0.09	0.34	0.007
21.684	0.000	0.33	0.09	0.34	0.007
21.800	0.000	0.32	0.09	0.33	0.007
21.916	0.000	0.32	0.09	0.33	0.007
22.032	0.000	0.32	0.09	0.32	0.006
22.148	0.000	0.31	0.09	0.32	0.006
22.264	0.000	0.31	0.09	0.32	0.006
22.380	0.000	0.30	0.09	0.31	0.006
22.496	0.000	0.30	0.08	0.31	0.006
22.612	0.000	0.30	0.08	0.31	0.006
22.728	0.000	0.29	0.08	0.30	0.006
22.844	0.000	0.29	0.08	0.30	0.006
22.960	0.000	0.29	0.08	0.29	0.006
23.076	0.000	0.29	0.08	0.29	0.006
23.192	0.000	0.28	0.08	0.29	0.006
23.308	0.000	0.28	0.08	0.29	0.006
23.424	0.000	0.28	0.08	0.28	0.006
23.540	0.000	0.27	0.08	0.28	0.006
23.656	0.000	0.27	0.08	0.28	0.006
23.772	0.000	0.27	0.07	0.27	0.005
23.888	0.000	0.27	0.07	0.27	0.005
24.004	0.000	0.26	0.07	0.27	0.005
24.120	0.000	0.00	0.05	0.22	0.003

APPENDICES

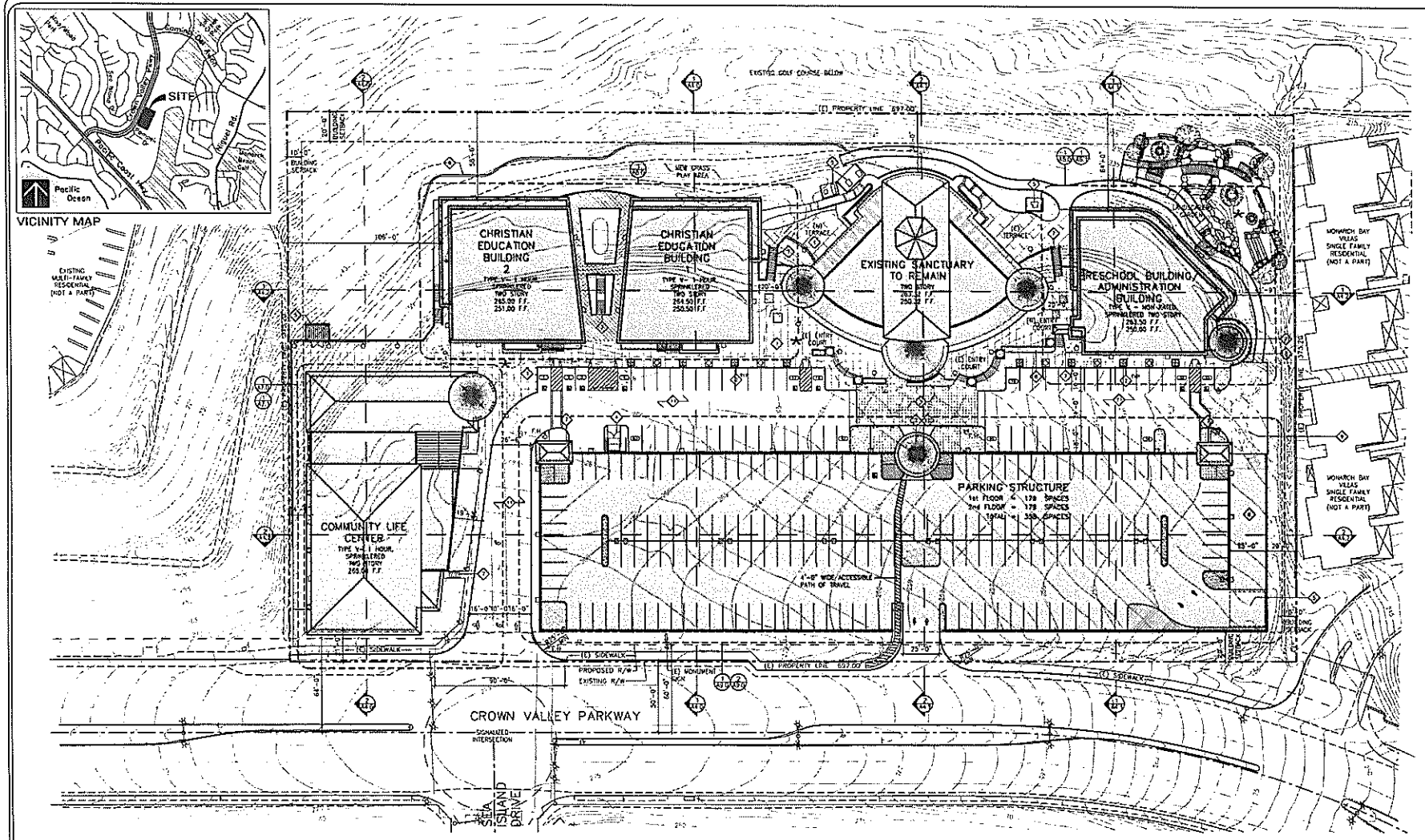
Proposed Master Site Plan

Hydrology and Hydraulic Report prepared by Boyle Engineering (1991)

Easement Agreement (for Off-Site Outlet Structure)

Hydrology Maps

- Existing Condition
- Developed Condition



KEY NOTES

1. NEW HARDSCAPE
2. NEW TREE WELL
3. NEW ENHANCED PAVING
4. NEW CMU TRASH ENCLOSURE WITH WOOD TRELLIS
5. ENH MECHANICAL EQUIPMENT ENCLOSURE BELOW
6. NEW RETAINING WALL "SOIL RETENTION" PLANTABLE, STACKING WALL SYSTEM. WALL HEIGHT VARIES
7. NEW STAIRS
8. NEW RAMP
9. OCFA HAMMERHEAD
10. NEW ELEVATOR
11. AC PAVING

LEGEND

- CENTERLINE
- BUILDING SETBACK
- PROPERTY LINE
- ACCESSIBLE PATH OF TRAVEL
- RIGHT OF WAY
- 275 TOPOGRAPHIC CONTOUR LINE
- LANDSCAPED AREA
- HARDSCAPE
- BUILDING
- POLE MOUNTED AREA LIGHT
- PEDESTRIAN AREA LIGHT
- WALL MOUNTED AREA LIGHTS, SEE SHEET A1.5.0 LIGHTING PLAN FOR MORE INFORMATION
- PROPOSED LOCATION OF "PUBLIC ART"

PARKING COUNT

63	ON SITE PARKING SPACES
179	SPACES 1st FLOOR PARKING STRUCTURE
179	SPACES 2nd FLOOR PARKING STRUCTURE
421	SPACES TOTAL

BUILDING AREA

COMMUNITY LIFE CENTER		CHRISTIAN EDUCATION			
		BUILDING 1		BUILDING 2	
1st FLR.	17,331 sf.	1st FLR	7,674	1st FLR.	7,750 sf.
2nd FLR.	6,983 sf.	2nd FLR	7,725	2nd FLR.	7,706 sf.
TOTAL:	24,314 sf.		15,399 sf.		15,456 sf.
PRESCHOOL/ADMIN. BLDG.		EXISTING SANCTUARY			
1st FLR	7,737 sf	1st FLR	9,140 sf.		
2nd FLR.	7,378 sf.	2nd FLR	9,938 sf.		
TOTAL:	15,115 sf.	TOTAL	19,078 sf.		

PROPOSED MASTER SITE PLAN 1"=30'-0" 1

\\MAROCK\Public\CLIENT FILES\South Shores Church\1235 - South Shores Church ..C.U.P\Architectural\AutoCad\C.U.P - SD DO_CUP Submittal 2

REVISIONS

07-7-07	CUP Submittal 2

ARCH/ENG STAMP

Conditional Use Permit Submittal for:
South Shores Church
32712 Crown Valley Parkway
Dana Point, California 92629

THOMAS maRock associates INC
1814 E. HOLT BLVD., STE. 105
ONTARIO, CALIFORNIA 91761
(909) 923-7777

DATE	ISSUE
04-05-06	CUP Submittal 1
3-18-11	PCL WALL REV.

JOB NO.
1235

DRWN/CHKD
SL/AM

SHT. TITLE
PROPOSED MASTER SITE PLAN

SHEET NO.
A3.0

HYDROLOGY AND HYDRAULIC

REPORT

FOR

SOUTH SHORES BAPTIST CHURCH

Prepared by:

David A. Boyle Engineering
2098 South Grand Avenue, Suite A
Santa Ana, California, 92705
(714) 957-8144

January, 1991

TABLE OF CONTENTS

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 OCEMA HYDROLOGY CRITERION)
        (c) Copyright 1982-89 Advanced Engineering Software (aes)
            Ver. 5.4A  Release Date: 8/21/89  Serial # 4105

                    Analysis prepared by:

                DAVID A. BOYLE ENGINEERING
              2098 SOUTH GRAND AVE.  SUITE A & B
                     SANTA ANA, CA
                     (714) 957-8144

--------------------------------------------------------------------------
  FILE NAME: SS.DAT
  TIME/DATE OF STUDY: 15:13   1/10/1991
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =  .95
  *DATA BANK RAINFALL USED*


**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =   2
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  SUBAREA A
==========================================================================
  DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   645.00
  UPSTREAM ELEVATION(FEET) =    272.20
  DOWNSTREAM ELEVATION(FEET) =    247.60
  ELEVATION DIFFERENCE(FEET) =     24.60
  TC(MIN.) =  .304*[(  645.00** 3.00)/(    24.60)]** .20 =    7.770
   100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.820
  SOIL CLASSIFICATION IS "D"
  COMMERCIAL SUBAREA LOSS RATE, Fm(INCH/HR) =  .0200
  SUBAREA RUNOFF(CFS) =      8.64
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =      8.64


**************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =   3
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.9
```

```
 UPSTREAM NODE ELEVATION(FEET) =    243.60
 DOWNSTREAM NODE ELEVATION(FEET) =   225.90
 FLOW LENGTH(FEET) =    123.00   MANNING'S N =  .013
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.64
 TRAVEL TIME(MIN.) =     .11    TC(MIN.) =    7.88

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.88
 RAINFALL INTENSITY(INCH/HR) =    4.79
 AVERAGED Fm(INCH/HR) =    .02
 EFFECTIVE STREAM AREA(ACRES) =     2.00
 TOTAL STREAM AREA(ACRES) =     2.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.64

****************************************************************************
 FLOW PROCESS FROM NODE     40.00 TO NODE     30.00 IS CODE =   2
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  SUBAREA B
============================================================================
 NATURAL POOR COVER
 TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   405.00
 UPSTREAM ELEVATION(FEET) =     266.50
 DOWNSTREAM ELEVATION(FEET) =     237.50
 ELEVATION DIFFERENCE(FEET) =      29.00
 TC(MIN.) =  .525*[(  405.00** 3.00)/(    29.00)]** .20 =    9.821
  100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.213
 SOIL CLASSIFICATION IS "D"
 NATURAL OR AGRICULTURE SUBAREA LOSS RATE, Fm(INCH/HR) =  .2000
 SUBAREA RUNOFF(CFS) =      3.25
 TOTAL AREA(ACRES) =      .90   PEAK FLOW RATE(CFS) =      3.25

****************************************************************************
 FLOW PROCESS FROM NODE     30.00 TO NODE     30.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.82
 RAINFALL INTENSITY(INCH/HR) =    4.21
 AVERAGED Fm(INCH/HR) =    .20
 EFFECTIVE STREAM AREA(ACRES) =      .90
 TOTAL STREAM AREA(ACRES) =      .90
```

```
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.15

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

 ** PEAK FLOW RATE TABLE **
        Q(CFS)    Tc(MIN.)    Fm(INCH/HR)    Ae(ACRES)
1        11.62        7.88          .068         2.72
2        10.85        9.82          .076         2.90

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     11.62   Tc(MIN.) =    7.884
 EFFECTIVE AREA(ACRES) =      2.72  AVERAGED Fm(INCH/HR) =   .07
 TOTAL AREA(ACRES) =      2.90


****************************************************************************
 FLOW PROCESS FROM NODE    30.00 TO NODE    50.00 IS CODE =   3
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  21.9
 UPSTREAM NODE ELEVATION(FEET) =   225.60
 DOWNSTREAM NODE ELEVATION(FEET) =   206.30
 FLOW LENGTH(FEET) =    84.30   MANNING'S N =  .013
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =     11.62
 TRAVEL TIME(MIN.) =    .06    TC(MIN.) =   7.95


****************************************************************************
 FLOW PROCESS FROM NODE    50.00 TO NODE    50.00 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.) =   7.95
 RAINFALL INTENSITY(INCH/HR) =   4.77
 AVERAGED Fm(INCH/HR) =   .07
 EFFECTIVE STREAM AREA(ACRES) =    2.72
 TOTAL STREAM AREA(ACRES) =    2.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.62


****************************************************************************
 FLOW PROCESS FROM NODE    60.00 TO NODE    50.00 IS CODE =   2
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<  SUBAREA C
============================================================================
 NATURAL AVERAGE COVER
 TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   550.00
```

```
 UPSTREAM ELEVATION(FEET) =     266.50
 DOWNSTREAM ELEVATION(FEET) =     207.70
 ELEVATION DIFFERENCE(FEET) =      58.80
 TC(MIN.) =  .706*[(  550.00** 3.00)/(     58.80)]** .20 =    13.777
  100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.476
 SOIL CLASSIFICATION IS "D"
 NATURAL OR AGRICULTURE SUBAREA LOSS RATE, Fm(INCH/HR) =  .2000
 SUBAREA RUNOFF(CFS) =        .88
 TOTAL AREA(ACRES) =        .30   PEAK FLOW RATE(CFS) =        .88


****************************************************************************
 FLOW PROCESS FROM NODE     50.00 TO NODE     50.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  13.78
 RAINFALL INTENSITY(INCH/HR) =   3.48
 AVERAGED Fm(INCH/HR) =   .20
 EFFECTIVE STREAM AREA(ACRES) =      .30
 TOTAL STREAM AREA(ACRES) =      .30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =        .88

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

 ** PEAK FLOW RATE TABLE **
        Q(CFS)    Tc(MIN.)   Fm(INCH/HR)    Ae(ACRES)
1        12.33        7.95         .076         2.90
2        11.63        9.89         .084         3.12
3         9.85       13.78         .087         3.20

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =     12.33   Tc(MIN.) =    7.948
 EFFECTIVE AREA(ACRES) =      2.90  AVERAGED Fm(INCH/HR) =   .08
 TOTAL AREA(ACRES) =      3.20
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       3.20  TC(MIN.) =       7.95
 EFFECTIVE AREA(ACRES) =       2.90  AVERAGED Fm(INCH/HR)=   .08
 PEAK FLOW RATE(CFS)    =      12.33
 *** PEAK FLOW RATE TABLE ***
        Q(CFS)    Tc(MIN.)    Fm(INCH/HR)    Ae(ACRES)
1        12.33        7.95         .076         2.90
2        11.63        9.89         .084         3.12
3         9.85       13.78         .087         3.20
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**********************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             (Reference: 1986 OCEMA HYDROLOGY CRITERION)
(c) Copyright 1982-89 Advanced Engineering Software (aes)
Ver. 5.4A  Release Date: 8.01/89  Serial # 4105

                        Analysis prepared by:

                    DAVID A. DOYLE ENGINEERING
                  2098 SOUTH GRAND AVE.  SUITE A & B
                        SANTA ANA, CA
                        (714) 957-8144

----------------------------------------------------------------------
  FILE NAME: 98.DAT
  TIME/DATE OF STUDY: 15:45   1/10/1991
======================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
======================================================================
                  --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE =  .95
  *DATA BANK RAINFALL USED*


**********************************************************************
  FLOW PROCESS FROM NODE    10.00 TO NODE    20.00 IS CODE =   2
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
======================================================================
  DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   645.00
  UPSTREAM ELEVATION(FEET) =    272.20
  DOWNSTREAM ELEVATION(FEET) =    247.60
  ELEVATION DIFFERENCE(FEET) =     24.60
  TC(MIN.) =  .304*[(  645.00** 3.00)/(    24.60)]** .20 =    7.770
  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.768
  SOIL CLASSIFICATION IS "D"
  COMMERCIAL SUBAREA LOSS RATE, Fm(INCH/HR) =  .0200
  SUBAREA RUNOFF(CFS) =      6.75
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =     6.75


**********************************************************************
  FLOW PROCESS FROM NODE    20.00 TO NODE    30.00 IS CODE =   3
----------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
======================================================================
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.9
  UPSTREAM NODE ELEVATION(FEET) =   243.60
  DOWNSTREAM NODE ELEVATION(FEET) =   225.80
  FLOW LENGTH(FEET) =   123.00   MANNING'S N =  .013
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      6.75
  TRAVEL TIME(MIN.) =     .12    TC(MIN.) =    7.89
```

```
 UPSTREAM NODE ELEVATION(FEET) =   240.50
 DOWNSTREAM NODE ELEVATION(FEET) =   225.80
 FLOW LENGTH(FEET) =   123.00   MANNING'S N =  .013
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      6.75
 TRAVEL TIME(MIN.) =    .12    TC(MIN.) =   7.89

****************************************************************************
 FLOW PROCESS FROM NODE    30.00 TO NODE    30.00 IS CODE =  1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   7.89
 RAINFALL INTENSITY(INCH/HR) =   3.74
 AVERAGED Fm(INCH/HR) =   .02
 EFFECTIVE STREAM AREA(ACRES) =   2.00
 TOTAL STREAM AREA(ACRES) =   2.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.75

****************************************************************************
 FLOW PROCESS FROM NODE    40.00 TO NODE    30.00 IS CODE =  2
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 NATURAL POOR COVER
 TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   405.00
 UPSTREAM ELEVATION(FEET) =    266.50
 DOWNSTREAM ELEVATION(FEET) =    237.50
 ELEVATION DIFFERENCE(FEET) =     29.00
 TC(MIN.) =  .525*[(  405.00** 3.00)/(    29.00)]** .20 =    9.821
  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.301
 SOIL CLASSIFICATION IS "D"
 NATURAL OR AGRICULTURE SUBAREA LOSS RATE, Fm(INCH/HR) =  .2000
 SUBAREA RUNOFF(CFS) =      2.51
 TOTAL AREA(ACRES) =      .90   PEAK FLOW RATE(CFS) =     2.51

****************************************************************************
 FLOW PROCESS FROM NODE    30.00 TO NODE    30.00 IS CODE =  1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   9.82
 RAINFALL INTENSITY(INCH/HR) =   3.30
 AVERAGED Fm(INCH/HR) =   .20
 EFFECTIVE STREAM AREA(ACRES) =    .90
 TOTAL STREAM AREA(ACRES) =    .90
```

```
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.51

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

 ** PEAK FLOW RATE TABLE **
        Q(CFS)    Tc(MIN.)    Fm(INCH/HR)    Ae(ACRES)
 1        9.05        7.89          .068         2.72
 2        8.46        9.82          .076         2.90

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      9.05   Tc(MIN.) =    7.89
 EFFECTIVE AREA(ACRES) =      2.72  AVERAGED Fm(INCH/HR) =   .07
 TOTAL AREA(ACRES) =      2.90


****************************************************************************
 FLOW PROCESS FROM NODE    30.00 TO NODE    50.00 IS CODE =   3
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  20.7
 UPSTREAM NODE ELEVATION(FEET) =   225.80
 DOWNSTREAM NODE ELEVATION(FEET) =   208.30
 FLOW LENGTH(FEET) =    84.30   MANNING'S N =  .013
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      9.05
 TRAVEL TIME(MIN.) =    .07    TC(MIN.) =   7.96


****************************************************************************
 FLOW PROCESS FROM NODE    50.00 TO NODE    50.00 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.) =   7.96
 RAINFALL INTENSITY(INCH/HR) =   3.73
 AVERAGED Fm(INCH/HR) =   .07
 EFFECTIVE STREAM AREA(ACRES) =   2.72
 TOTAL STREAM AREA(ACRES) =   2.90
 PEAK FLOW RATE(CFS) AT CONFLUENCE =   9.05

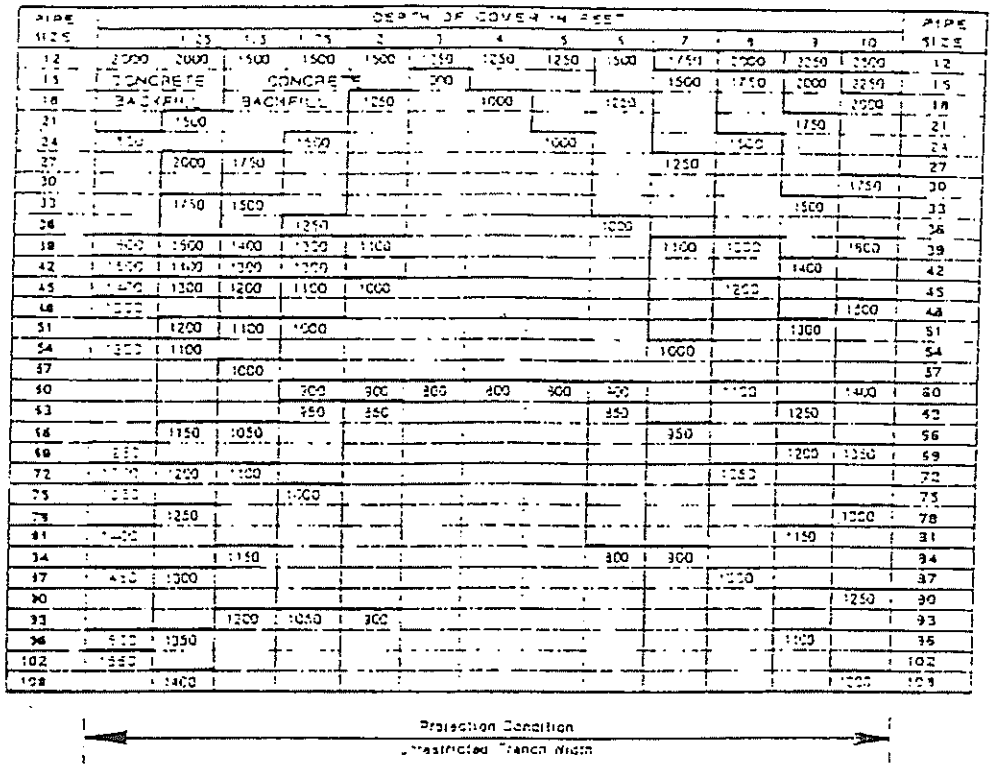

****************************************************************************
 FLOW PROCESS FROM NODE    60.00 TO NODE    50.00 IS CODE =   2
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 NATURAL AVERAGE COVER
 TC = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]** .20
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   550.00
```

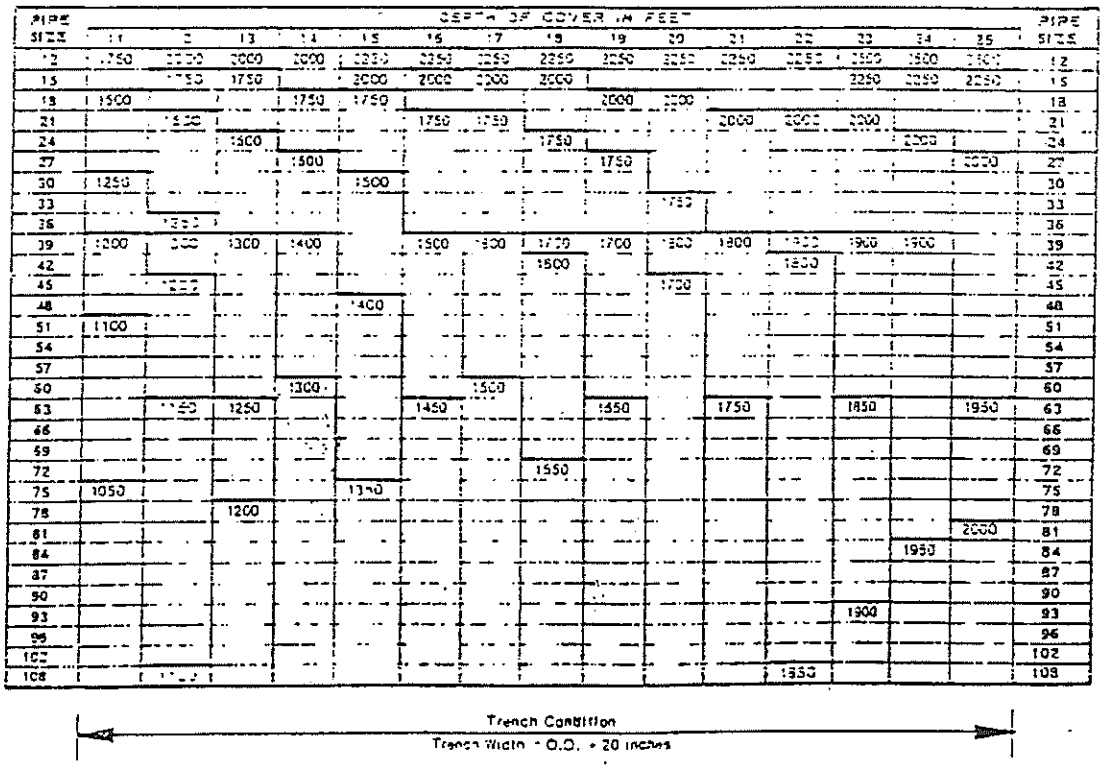
```
 UPSTREAM ELEVATION(FEET) =     266.50
 DOWNSTREAM ELEVATION(FEET) =    207.70
 ELEVATION DIFFERENCE(FEET) =     58.80
 TC(MIN.) =  .706*[( 550.00** 3.00)/(    58.80)]** .20 =   13.777
   25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.727
 SOIL CLASSIFICATION IS "D"
 NATURAL OR AGRICULTURE SUBAREA LOSS RATE, Fm(INCH/HR) =  .2000
 SUBAREA RUNOFF(CFS) =       .68
 TOTAL AREA(ACRES) =       .30   PEAK FLOW RATE(CFS) =       .68


 FLOW PROCESS FROM NODE    50.00 TO NODE    50.00 IS CODE =   1
----------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
======================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =  13.78
 RAINFALL INTENSITY(INCH/HR) =   2.73
 AVERAGED Fm(INCH/HR) =   .20
 EFFECTIVE STREAM AREA(ACRES) =     .30
 TOTAL STREAM AREA(ACRES) =     .30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       .68

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.
 ** PEAK FLOW RATE TABLE **
      Q(CFS)   Tc(MIN.)   Fm(INCH/HR)   Ae(ACRES)
1      9.60      7.96        .076         2.90
2      9.06      9.89        .084         3.12
3      7.67     13.78        .087         3.20
 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      9.60   Tc(MIN.) =    7.959
 EFFECTIVE AREA(ACRES) =     2.90  AVERAGED Fm(INCH/HR) =  .08
 TOTAL AREA(ACRES) =     3.20
======================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) =     3.20  TC(MIN.) =    7.96
 EFFECTIVE AREA(ACRES) =     2.90  AVERAGED Fm(INCH/HR)=  .08
 PEAK FLOW RATE(CFS) =     9.60
 *** PEAK FLOW RATE TABLE ***
      Q(CFS)   Tc(MIN.)   Fm(INCH/HR)   Ae(ACRES)
1      9.60      7.96        .076         2.90
2      9.06      9.89        .084         3.12
3      7.67     13.78        .087         3.20
======================================================================
======================================================================
 END OF RATIONAL METHOD ANALYSIS
```

All pipes and conduits laid parallel to the roadway shall be placed at least five (5) feet from the edge of the pavement or graded traveled roadway, unless otherwise authorized in writing by the Commissioner. The shallowest portion of any pipeline or other facility shall be installed not less than thirty (30) inches below the roadway surface. ((Code 1961, § 63.0822)





DATA:

DESIGN DENSITY = 110 pcf

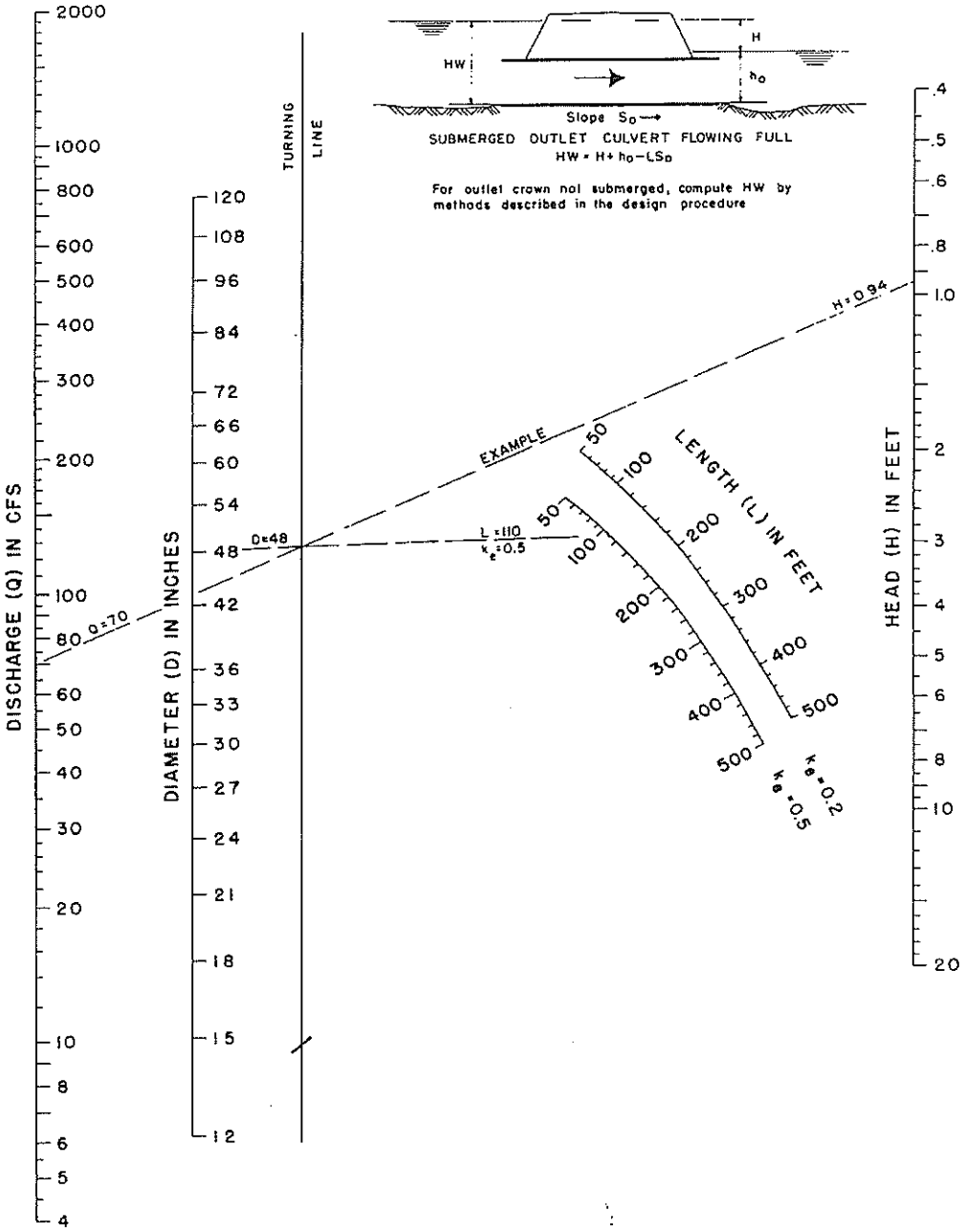
LOAD FACTOR = 1.8

LIVE LOAD - H20 - S16 - 44 TRUCK

ORANGE COUNTY FLOOD CONTROL DISTRICT

D - LOAD TABLE FOR REINFORCED CONCRETE PIPE

1972	1 OF 1	ST-29



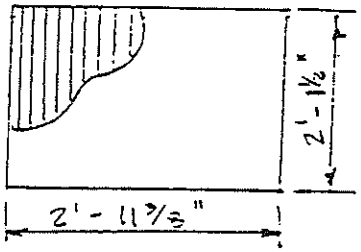
HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

11-12-9 C
S23-100-3

CAPACITY OF CURBSIDE GRATING CATCH BASIN IN SUMP CONDITION

REF: Capacity of Grate Inlet in Sump
Bureau of Public Roads
O.C. FLOOD CONTROL DIST. DESIGN MANUAL



PLAN VIEW
GRATE INLET

$P_{perimeter} = 2(2'-11\frac{3}{8}" + 2'-1\frac{1}{2}")$

$= 10.15'$

Assume 25% clogging -

$P = (.75)10.15' = 7.61'$

$Q_{25} = 6.75$ cfs (per Hydrology calcs)

$\frac{Q}{P} = \frac{6.75 \text{ ft}^3/\text{s}}{7.6 \text{ ft}} = 0.89$

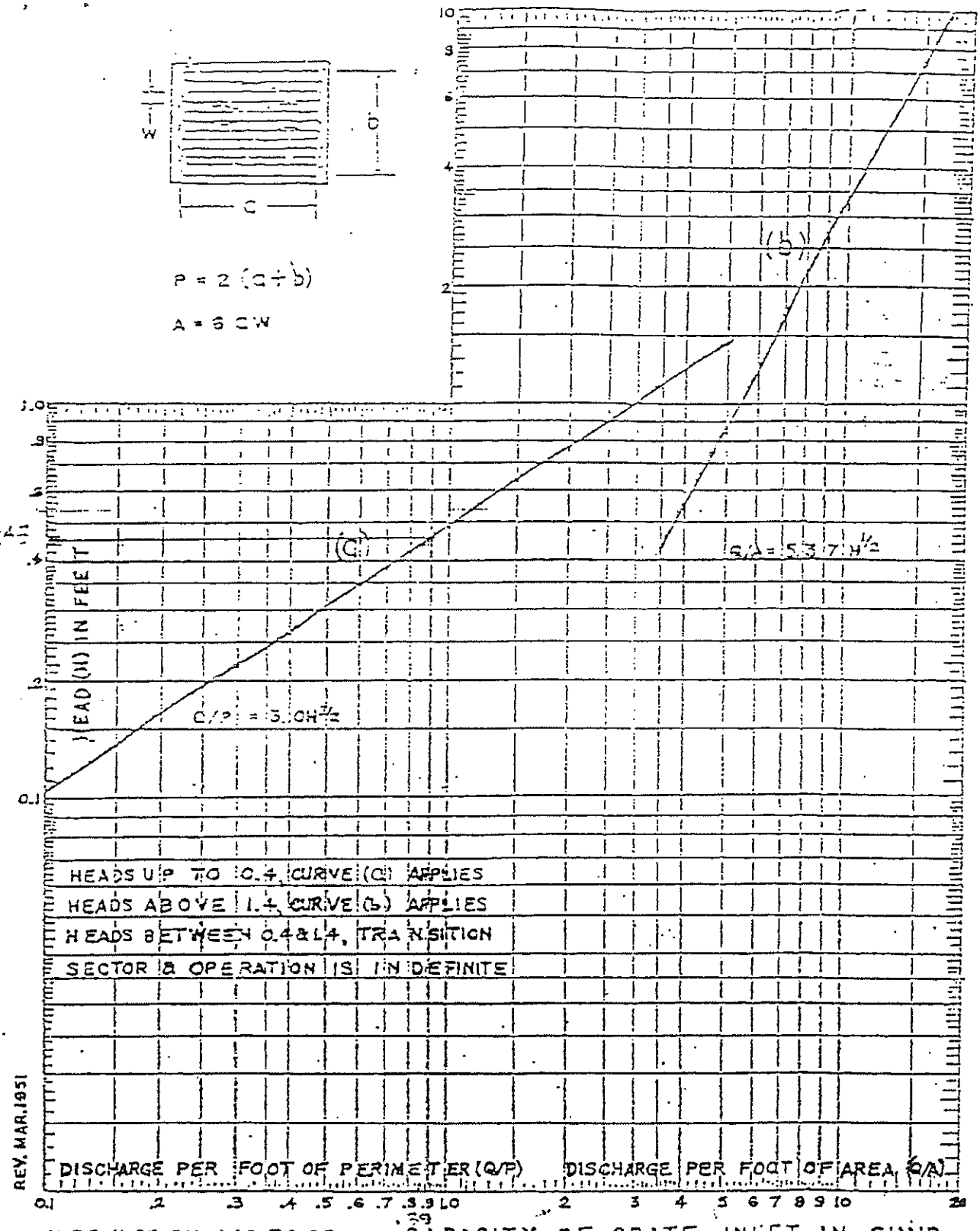
From nomograph: Head (H) = 0.45' < 0.5' (C.F. HEIGHT)

ok.

$Q_{100} = 8.6$ cfs (per Hydrology calcs)

$\frac{Q}{P} = \frac{8.6 \text{ ft}^3/\text{s}}{7.61 \text{ ft}} = 1.13$

From nomograph: H = 0.53' this is slightly higher than curb height at grate location. However, as the finish ground @ T.C. slopes upward and .03' is less than ½", there is negligible ponding above top of curb.



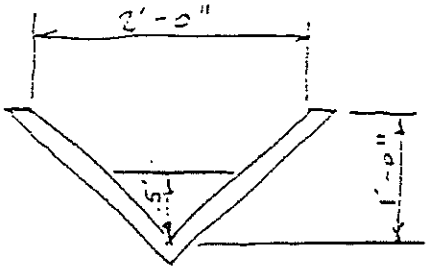
BUREAU OF PUBLIC ROADS
DIVISION TWO WASH, D.C.

CAPACITY OF GRATE INLET IN SUMP
WATER PONDED ON GRATE

ASSUME 25% CLOGGING

CAPACITY OF PROPOSED 2'-0" WIDE CONC. INTERCEPTOR DRAIN FLOWING 1/2 FULL

11-13-90
S23-100-S



assume $n = .014$
$S = 10\%$

Manning's $V = \frac{1.49}{.014}(.177)^{2/3}(.10)^{1/2}$

$= 10.6$ ft/s

$r = C_1 D$ (Brater: King Handbook of Hydr.

$r = .354(.5')$
$= .177$

$Q_{CAP} = V \cdot A$

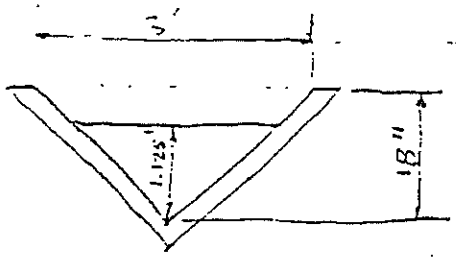
$= (10.6)(0.5')(1.0')\frac{1}{2}$

$Q_{CAP} = 2.6$ cfs $>$ $Q_{100} = 0.55$ cfs (Hydrology calcs - Subarea 2)

$\therefore$ OK

CAPACITY OF EXISTING V-DITCH - FLOWING 3/4 FULL

11-12-90
SCS-100-01



assume: $n = .014$
$s = 3\%$

$$V = \frac{1.49}{.014}(.395)^{2/3}(.03)^{1/2}$$

$$V = 9.97 \text{ fps}$$

$r = C_r D$ (Brater & King, Handbook of Hydraulics)

$= .354(1.125)$

$= 0.398$

$$Q_{cap} = V \cdot A$$

$= (9.97)(1.125')(1.25)$

$Q = 12.6$ cfs ← CAPACITY OF V-DITCH FLOWING 3/4 FULL AT AN ESTIMATED SLOPE OF 3%.

$Q_{100} = 12.3$ cfs ← 100 YR STORM FLOW FROM CHURCH SITE

$Q_{100} = 12.3$ cfs $<$ $Q_{cap} = 12.6$ cfs ∴ O.K.

CIVILSOFT COMPUTATION

PRIV. STORM DRAIN HYDRAULICS JS 5/28

S23-100-02

WATER SURFACE PROFILE LISTING

SINGLE REACH

O STATION / O L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH		HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBP
0 100.00	209.30	.78	209.78	11.9	18.82	5.88	215.09	.00	1.00		1.00	.00	.00	0	
0 2.48	.03000					.15819	.38			1.00			.00		
0 102.48	209.37	.74	209.81	11.9	19.09	5.67	215.48	.00	1.00		1.00	.00	.00	0	
0 3.81	.03000					.16299	.65			1.00			.00		
0 106.29	209.19	.71	209.90	11.9	20.00	5.98	215.13	.00	1.00		1.00	.00	.00	0	
0 3.71	.03000					.13006	.71			1.00			.00		
0 110.00	209.30	.68	209.98	11.9	21.00	6.86	215.83	.00	1.00		1.00	.00	.00	0	
0 .00	.03000					.20125	.00			1.00			.00		
0 110.00	209.30	.68	209.98	11.9	21.00	6.86	215.83	.00	1.00		1.00	.00	.00	0	
0 35.10	.20633					.13185	6.78			.67			.00		
0 145.10	216.54	.70	217.25	11.9	20.13	6.33	223.57	.00	1.00		1.00	.00	.00	0	
0 16.19	.20633					.17278	2.80			.67			.00		
0 161.29	219.89	.73	220.62	11.9	19.24	5.75	225.37	.00	1.00		1.00	.00	.00	0	
0 9.47	.20633					.15482	1.47			.67			.00		
0 170.77	221.84	.77	222.61	11.9	18.34	5.23	227.84	.00	1.00		1.00	.00	.00	0	
0 6.53	.20633					.13951	.91			.67			.00		
0 177.30	223.19	.81	223.99	11.9	17.49	4.75	228.75	.00	1.00		1.00	.00	.00	0	
0 4.87	.20633					.12686	.62			.67			.00		
0 182.17	224.19	.85	225.04	11.9	16.57	4.32	229.36	.00	1.00		1.00	.00	.00	0	
0 3.81	.20633					.11717	.45			.67			.00		
0 185.98	224.98	.91	225.88	11.9	15.90	3.93	229.81	.00	1.00		1.00	.00	.00	0	
0 3.02	.20633					.11632	.36			.67			.00		
1															

WATER SURFACE PROFILE LISTING

SINGLE REACH

O STATION / O L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH / NORM DEPTH		HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBP
0 189.00	225.60	1.00	226.50	11.9	15.16	3.57	230.17	.00	1.00		1.00	.00	.00	0	
OJUNCT STR	.08000					.09554	.24						.00		

	191.50	225.37	4.45	229.25	8.6	19.35	1.86	233.11	.00	.99		1.00	.00	.00	
	37.42	.11801					.6757	2.53			.55			.00	
	228.92	230.22	2.56	232.77	8.6	19.35	1.85	234.64	.00	.99		1.00	.00	.00	
HYDRAULIC JUMP														.00	
	228.92	230.22	.80	230.85	8.6	16.49	4.23	235.07	.00	.95		1.00	.00	.00	0
	15.82	.11801					.13131	2.38			.55			.00	
0	244.74	232.38	.82	232.70	8.6	18.74	4.85	237.55	.00	.95		1.00	.00	.00	0
0	16.59	.11801					.14250	2.38			.55			.00	
	261.48	234.05	.80	234.85	8.6	17.85	4.79	239.44	.00	.99		1.00	.00	.00	0
0	10.57	.11801					.15118	1.70			.55			.00	
0	270.00	235.30	.87	235.87	8.6	18.41	5.27	241.14	.00	.99		1.00	.00	.00	0
	.00	.11801					.17117	.00			.55			.00	
0	270.00	235.30	.87	235.87	8.6	18.41	5.27	241.14	.00	.99		1.00	.00	.00	0
	11.35	.19624					.13256	1.93			.55			.00	
	283.35	237.62	.59	238.22	8.6	17.67	4.36	242.07	.00	.99		1.00	.00	.00	0
	8.15	.19624					.14511	1.18			.55			.00	
	292.01	239.23	.62	239.85	8.6	16.85	4.41	244.25	.00	.99		1.00	.00	.00	0
	5.55	.19624					.12857	.71			.55			.00	
0	297.56	240.32	.64	240.96	8.6	16.07	4.01	244.97	.00	.99		1.00	.00	.00	0
0	4.11	.19624					.11429	.47			.55			.00	

WATER SURFACE PROFILE LISTING

SINGLE REACH

0 STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL PIER	NO	AVBP
0 L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
0 301.66	241.12	.67	241.79	8.6	15.32	3.65	245.44	.00	.99		1.00	.00	.00	0	
0 3.20	.19624					.10161	.32			.55			.00		
0 304.86	241.75	.70	242.45	8.6	14.61	3.32	245.77	.00	.99		1.00	.00	.00	0	
0 2.55	.19624					.09065	.23			.55			.00		
0 307.41	242.25	.73	242.98	8.6	13.93	3.01	246.00	.00	.99		1.00	.00	.00	0	
0 2.06	.19624					.08123	.17			.55			.00		
0 309.49	242.66	.77	243.43	8.6	13.28	2.74	246.17	.00	.99		1.00	.00	.00	0	
0 1.71	.19624					.07319	.13			.55			.00		
0 311.20	242.99	.81	243.80	8.5	12.66	2.49	246.29	.00	.99		1.00	.00	.00	0	
0 1.41	.19624					.06650	.09			.55			.00		

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.79	239.44	.00	.99		1.00	.00	.00	0
0	10.57	.11301					.15118	1.70			.55			.00	
0	272.00	235.30	.57	235.87	8.6	18.41	5.27	241.14	.00	.99		1.00	.00	.00	0
0	.00	.11301					.17117	.00			.55			.00	
0	272.00	235.30	.57	235.87	8.6	18.41	5.27	241.14	.00	.99		1.00	.00	.00	0
0	11.35	.19624					.15253	1.33			.55			.00	
0	283.35	237.62	.59	238.22	8.6	17.67	4.86	243.07	.00	.99		1.00	.00	.00	0
0	8.16	.19624					.14511	1.18			.55			.00	
0	292.01	239.23	.62	239.85	8.6	16.85	4.41	244.26	.00	.99		1.00	.00	.00	0
0	5.55	.19624					.12857	.71			.55			.00	
0	297.56	240.32	.64	240.96	8.6	16.07	4.01	244.97	.00	.99		1.00	.00	.00	0
0	4.11	.19624					.11420	.47			.55			.00	

WATER SURFACE PROFILE LISTING

SINGLE REACH

	STATION / L/ELEM	INVERT ELEV / SO	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD / SF AVE	ENERGY GRD.EL. / HF	SUPER ELEV	CRITICAL DEPTH	NORM DEPTH	HGT/ DIA	BASE/ ID NO.	ZL / ZR	NO PIER	AVBPR
0	301.66	241.12	.67	241.79	8.6	15.32	3.65	245.44	.00	.99		1.00	.00	.00	0	
0	3.20	.19624					.10161	.32			.55			.00		
0	304.86	241.75	.70	242.45	8.6	14.61	3.32	245.77	.00	.99		1.00	.00	.00	0	
0	2.55	.19624					.09065	.23			.55			.00		
0	307.41	242.25	.73	242.98	8.6	13.93	3.01	246.00	.00	.99		1.00	.00	.00	0	
0	2.08	.19624					.08123	.17			.55			.00		
0	309.49	242.66	.77	243.43	8.6	13.29	2.74	246.17	.00	.99		1.00	.00	.00	0	
0	1.71	.19624					.07319	.13			.55			.00		
0	311.20	242.99	.81	243.80	8.6	12.66	2.49	246.29	.00	.99		1.00	.00	.00	0	
0	1.41	.19624					.06650	.09			.55			.00		
0	312.61	243.27	.85	244.12	8.6	12.07	2.26	246.38	.00	.99		1.00	.00	.00	0	.00
0	1.13	.19624					.06135	.07			.55			.00		
0	313.74	243.49	.90	244.39	8.6	11.51	2.06	246.45	.00	.99		1.00	.00	.00	0	
0	.76	.19624					.06062	.05			.55			.00		
0	314.50	243.54	.99	244.53	8.6	10.97	1.87	246.50	.00	.99		1.00	.00	.00	0	

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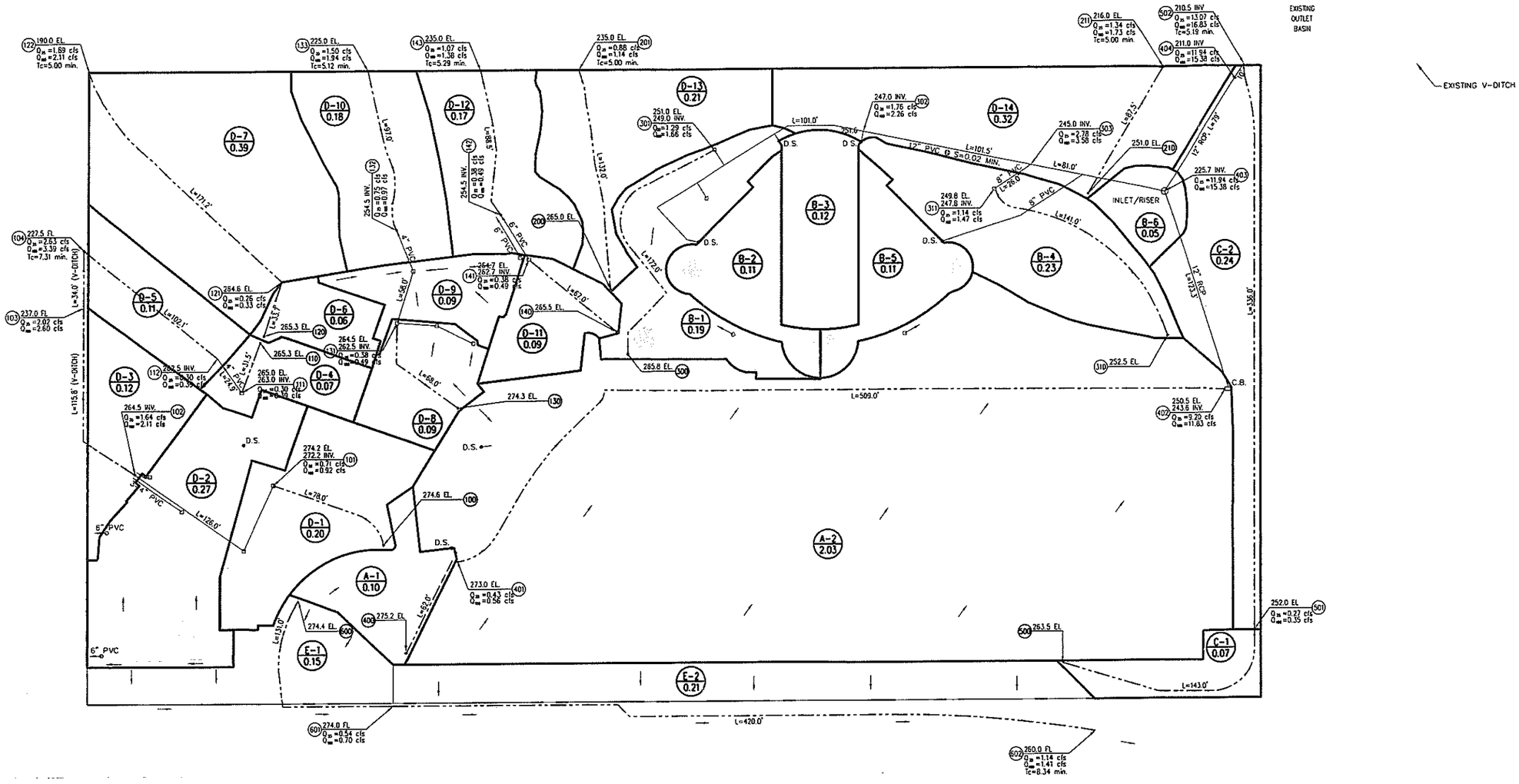


LEGEND

- A-1 / 0.16 — AREA DESIGNATION / AREA IN ACRES
- PATH OF TRAVEL
- L=150' — INITIAL SUB AREA FLOW LENGTH
- TRIBUTARY BOUNDARY
- ELEV / (X) — FINISH GRADE / FLOW LINE / ELEVATION; NODE NUMBER
- Q_{25} = XX.X cfs — DISCHARGE AT NODE IN CFS FOR 25 YEAR STORM
- Q_{100} = XX.X cfs — DISCHARGE AT NODE IN CFS FOR 100 YEAR STORM
- Tc= X.X min. — TIME OF CONCENTRATION IN MINUTES

EXISTING CONDITIONS
HYDROLOGY MAP

30' 20' 10' 0' 30' 60'
GRAPHIC SCALE: 1" = 30'

REGISTERED PROFESSIONAL ENGINEER NICHOLAS A. STREETER No. 70862 EXP. 06/30/13 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:
ADAMS • STREETER
CIVIL ENGINEERS, INC.
15 Corporate Park, Irvine, CA 92606
PH:949 474-2330 Fax:949 474-0331

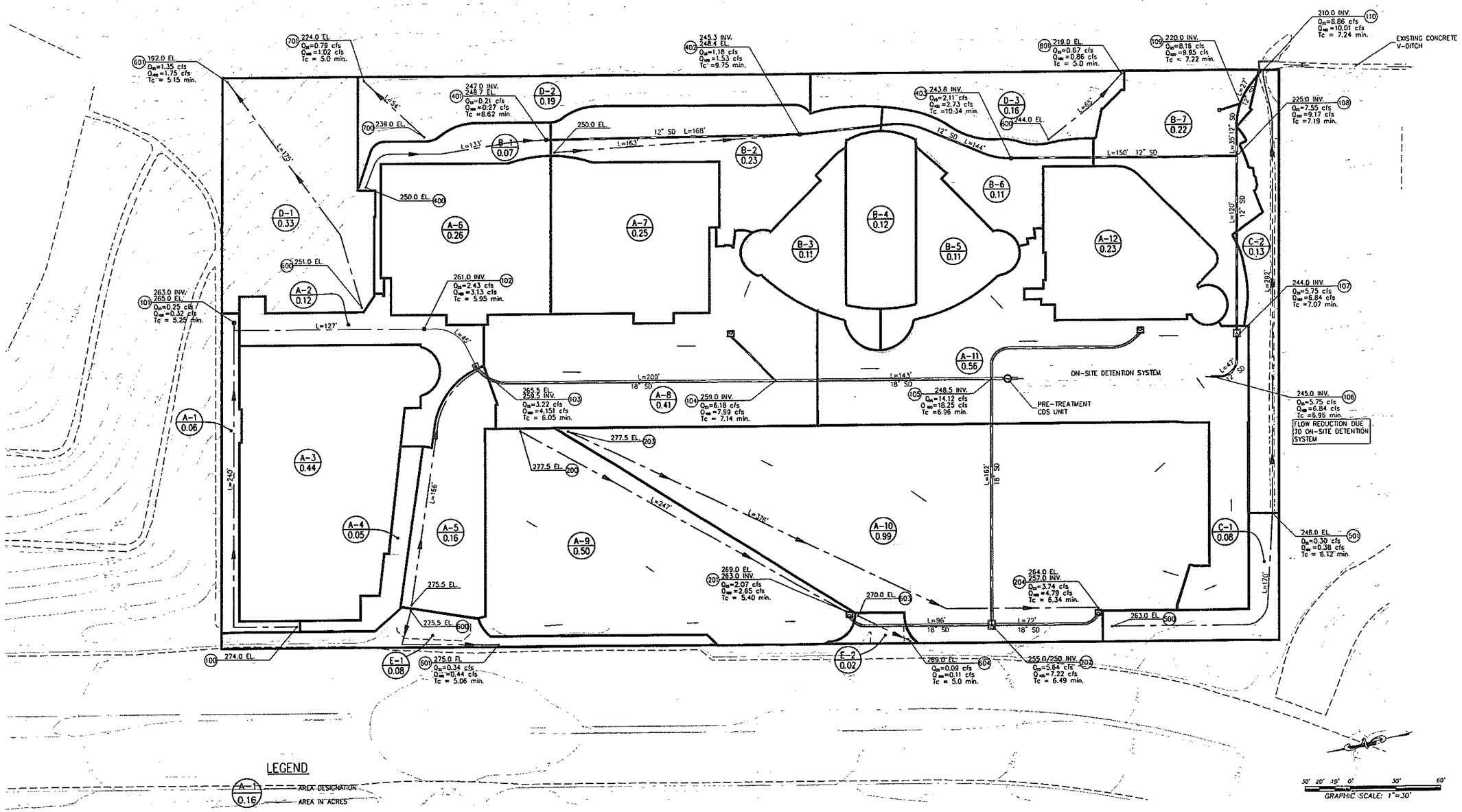
NICHOLAS A. STREETER
R.C.E. NO.: 70862
DATE EXP. 06-30-13

HYDROLOGY MAP
EXISTING CONDITIONS

SOUTH SHORES CHURCH
32712 CROWN VALLEY PARKWAY
DANA POINT, CA 92629

SHEET NO. 1
OF 1 SHTS.

I:\2007\07-1643 SSC\rm Dana Point\Hydrology Study\HYDRO.DGN 07-1643HYD.dwg



DEVELOPED CONDITIONS
HYDROLOGY MAP

REGISTERED PROFESSIONAL ENGINEER NICHOLAS A. STREETER No. 70862 EXP. 06/30/13 CIVIL STATE OF CALIFORNIA

PREPARED UNDER THE SUPERVISION OF:
ADAMS · STREETER CIVIL ENGINEERS, INC.
15 Corporate Park, Irvine, CA 92606
PH:(949) 474-2200 FAX:(949) 474-2525

NICHOLAS A. STREETER
R.C.E. NO.: 70862
DATE EXP. 06-30-13

HYDROLOGY MAP
DEVELOPED CONDITIONS

SOUTH SHORES CHURCH
32712 CROWN VALLEY PARKWAY
DANA POINT, CA 92629

SHEET NO. 1
OF 1 SHTS.

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APPENDIX H

NOISE AND VIBRATION ANALYSIS

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NOISE IMPACT ANALYSIS

SOUTH SHORES CHURCH MASTER PLAN
CITY OF DANA POINT, CALIFORNIA

LSA

August 2014

NOISE IMPACT ANALYSIS

SOUTH SHORES CHURCH MASTER PLAN

CITY OF DANA POINT, CALIFORNIA

Submitted to:

City of Dana Point
33282 Golden Lantern, Suite 209
Dana Point, California 92629

Prepared by:

LSA Associates, Inc.
20 Executive Park, Suite 200
Irvine, California 92614
(949) 553-0666

Project No. DPC0902

LSA

August 2014

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INTRODUCTION

This noise impact analysis has been prepared to evaluate the potential noise impacts and mitigation measures associated with the South Shores Church Master Plan (proposed project). This report is intended to satisfy the City of Dana Point's (City) requirement for a project-specific noise impact analysis by examining the impacts of the proposed uses on the project site and evaluating the mitigation measures required by the project.

PROJECT DESCRIPTION

Project Location

The project site is located at 32712 Crown Valley Parkway in the northern portion of the City. The site is bounded by Crown Valley Parkway to the west, the Monarch Bay Villas to the south, an undeveloped hillside and the Monarch Beach Golf Links golf course to the east, and the Monarch Coast Apartments to the north. The approximate 6-acre (ac) project site is generally rectangular in shape and is currently developed with the existing South Shores Church development. Refer to Figure 1 for the location of the project site.

Project Site Existing Setting

The existing church development includes a Sanctuary, Chapel, Administration and Fellowship Hall, Preschool, and parking lot. The 6,717-square-foot (sf) Preschool building is located in the northwestern part of the project site adjacent to Crown Valley Parkway. The children's play area is located southeast of the Preschool building and is surrounded by grass landscaping. The 12,985 sf Administration and Fellowship Hall building is located southeast of the playground, and the 3,765 sf Chapel is located southeast of the Administration and Fellowship Hall. The 19,078 sf Sanctuary is located in the central-eastern portion of the project site. An undeveloped slope descending from southwest to northeast is located on the northeastern boundary of the project site.

Existing access to the project site is provided by a signalized driveway south of the Preschool building at the intersection of Sea Island Drive and Crown Valley Parkway and a right-turn-in, right-turn-out-only driveway south of the intersection. The existing parking lot includes 228 parking spaces and is located on the southwestern portion of the project site. Ornamental landscaping surrounds the existing buildings and parking area, while a limited amount of natural vegetation is present on the undeveloped slope on the east side of the project site. Table A lists the existing development uses and associated square footage.

LSA

FIGURE 1

SOURCE: The Thomas Guide

South Shores Church Master Plan

Project Site

I:\DPC0902\G\AQ-Noise\Project Site.cdr (7/15/14)

Table A: Existing Development

Land Use	Area
Parking	228 at-grade spaces
Sanctuary	19,078 sf
Chapel	3,765 sf
Administration and Fellowship Hall	12,985 sf
Preschool	6,717 sf
Total Existing Area	**42,545 sf**

Source: Matlock Associates (December 2013).
sf = square feet

Surrounding Land Uses

The project site is bounded on the west by Crown Valley Parkway, with single-family residential beyond. The Monarch Bay Villas border the project site immediately to the south with the Monarch Bay Plaza Shopping Center beyond, which includes grocery, restaurant, medical office, Preschool, pharmacy, gas station, and other commercial/retail uses. Pacific Coast Highway (PCH) fronts the shopping center on the southwest. The project site is bounded on the east by a vacant hillside, the paved Salt Creek recreational trail, the Monarch Beach Golf Links golf course, Salt Creek, and single-family residential beyond. The project site is bounded to the north by the Monarch Coast Apartments and beyond by Camino del Avion.

Proposed Project

With the exception of the Sanctuary built in the 1990s, the current buildings on site have become dated and less than optimal for accommodating existing church activities and functions. The Preschool utilizes several buildings including temporary classrooms that are over 40 years old. Christian education classes and church committees meet in various rooms not specifically intended as meeting spaces, including the Pastor's office. The existing Fellowship Hall space is too small for church-wide gatherings such as luncheons and celebratory events.

Consequently, the buildings proposed as part of the Master Plan will be used to accommodate existing church activities and functions. The Church does not intend to expand the Preschool enrollment or expand the capacity of the Sanctuary for Sunday services. The Sunday services will continue as currently scheduled. Other than the Community Life Center building discussed below, the proposed Master Plan facilities essentially replace current outdated facilities and provide dedicated spaces for ongoing church activities that currently occur in spaces not necessarily intended or well-suited to accommodate such activities.

Upon completion, the Community Life Center building will accommodate a larger percentage of the congregation for church-wide events, but any such event will not be held during times that conflict with Sunday services or the Church's peak weekday activity, the Wednesday Women's Bible Study Fellowship. The Community Life Center would also allow the Church to organize a youth basketball and/or volleyball league. The league, however, would not operate on Sundays during peak hours or at the same time as the Wednesday Women's Bible Study Fellowship. The size of the Community Life Center further limits how many games/practices could be held simultaneously. To implement the

Master Plan, the South Shores Church proposes to demolish the existing Preschool, Administration and Fellowship Hall building, Chapel, and parking lot. As listed in Table B, total demolition would include 23,467 sf of building space. As listed in Table C, the proposed project includes construction of a total of 70,284 sf of new building space, including a new Preschool/Administration building, two new Christian Education buildings, a Community Life Center, and a two-level partially subterranean Parking Structure (see Figure 2, Proposed Master Plan). No construction or modifications to the existing Sanctuary building are proposed as part of this project. The project is proposed in five phases over a 10-year period; however, construction activities would not occur continuously over the 10-year period. Construction phases are detailed in the following discussion.

Table B: Existing On-Site Buildings

Existing Building	Proposed Action	Area (sf)
Sanctuary	No Planned Construction	19,078
Total Area to Remain		**19,078**
Chapel	Demolition	3,765
Administration and Fellowship Hall	Demolition	12,985
Preschool	Demolition	6,717
Total Area to be Demolished		**23,467**

Source: Matlock Associates (December 2013).
sf = square feet

Table C: Proposed Master Plan Buildings

Proposed Master Plan Buildings	Existing or New Construction	First Floor Area (sf)	Second Floor Area (sf)	Total Building Area (sf)
Sanctuary	Existing Building to Remain	9,140	9,938	19,078
Total Area to Remain				**19,078**
Preschool/Administration Building	Proposed	7,737	7,378	15,115
Community Life Center	Proposed	17,331	6,983	24,314
Christian Education Building 1	Proposed	7,674	7,725	15,399
Christian Education Building 2	Proposed	7,750	7,706	15,456
Total New Construction				**70,284**
Total Master Plan Building Area				**89,362**

Source: Matlock Associates (December 2013).
sf = square feet

Phase 1A: Construct New Preschool/Administration Building. Construction of Phase 1A is anticipated to be completed over 13 months and would involve the import of approximately 700 cubic yards (cy) of soil to the project site. An underground storm water detention system would be constructed beneath a portion of the existing parking area at the southern end of the project site. The proposed 15,115 sf Preschool/Administration building would be the first new building constructed on the project site. This two-story building would be approximately 31 feet (ft) in height, with one story at ground level and the other partially below grade on the west and north elevations. The proposed Preschool would be located on the lower level and would be comprised of six classrooms, staff offices, a janitorial room, restrooms, a break room, and miscellaneous mechanical, storage, and