SAN DIEGO GAS & ELECTRIC
SUNCREST SUBSTATION
DRAINAGE STUDY

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1. INTRODUCTION

1.1 Purpose of Study

This study has been prepared in order to provide hydrologic and hydraulic analyses in support of Grading and Improvement plans for the proposed Suncrest Substation for San Diego Gas & Electric Company (SDGE). The proposed site development is for substation pad and access road. This study shows surrounding detail and onsite drainage patterns.

A hydrologic model was developed using industry-standard engineering practices. First, watershed boundaries, points of flow concentrations and land uses were established. The data was then entered into hydrologic modeling software for calculations of the 100-year, 6-hour peak storm flows. Finally, a hydrology exhibit was prepared to illustrate the modeling procedure and hydrologic characteristics of the existing and proposed conditions.

Hydraulic calculations were performed to size the proposed storm drain collection systems, brow ditches, and detention basins.

1.2 Scope

This study involves the hydrologic and hydraulic analysis of the proposed substation pad and access road and existing run-on flow areas. Storm drain pipes, brow ditches, and detention basins within the project limits have been sized to convey the 100-year design flows. This study should be used to evaluate pre- and post-development hydrologic conditions as well as post-development hydraulic design.

2. DESCRIPTION OF WATERSHED

2.1 Area Characteristics

The existing site is a large undeveloped parcel and is located approximately six miles east of the unincorporated community of Alpine within San Diego County, California. The site is located approximately 3 miles west of Japatul Valley Road and immediately south of Bell Bluff Truck Trail. The existing site is located north of the Cleveland National Forest and is comprised of undisturbed mountainous terrain with native vegetation. Runoff flows overland from the north to the south, then shifts towards the southwest as it crosses the proposed substation pad. The proposed site eventually drains to Peterson Creek, which drains into the Sweetwater River, which then drains into the Loveland Reservoir.

2.2 Soil Type

The soil classification used in this analysis is Type “D”. The San Diego County Hydrology Manual recommends that soil type “D” be assumed for all urban areas when determining runoff coefficients. Type “D” describes soils having very slow infiltration rates when thoroughly wet. Type “D” soils are characterized as severely erodible; requiring protective measures prior to and during soil disturbances.

2.3 Land Uses

The existing land use is undeveloped. The proposed site will consist of asphalt pavement for the access road, decomposed granite (Class II Base) for the substation pad, and landscaping surrounding much of the substation pad.

3. METHODOLOGY

3.1 Modified Rational Method

Per the San Diego County Hydrology Manual (dated June 2003) for watersheds less than one square mile with stream junctions, we used the modified rational formula, as excerpted below. Applicable tables and charts for this method can be found in Appendix A of this report. Calculations were prepared using AES software. The calculations are included in Appendix B.

From the Hydrology Manual, this method is as follows:

Q = CIA, where:

Q is the discharge in cubic feet per second (cfs)

C is a runoff coefficient, proportion of the rainfall that runs off the surface (no units).

I is the average rainfall intensity in inches per hour for a storm duration equal to the time of concentration (Tc) of the contributing drainage area.

A is the drainage area in acres tributary to the design point.

Runoff Coefficient, C

For existing conditions, the San Diego County Hydrology Manual was initially used. We chose the Permanent Open Space runoff coefficient within soil Type "D" (see section 2.2 for soil type discussion). Under this assumption, the runoff coefficient is 0.35 (see Appendix A).

For proposed conditions, runoff coefficient (C) values were chosen as follows: 0.45 for the substation pad (Class II Base), 0.40 for graded slopes, 0.95 for paved areas, and 0.35 for undisturbed areas. Weighted C values were calculated for the proposed improvement areas by the following equation: C = 0.45 x (% substation pad) + 0.40 x (% graded slope) + 0.95 x (% pavement) + 0.35 x (% undisturbed). See Appendix B for calculations.

Time of Concentration, Tc

The time of concentration is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

Methods of calculation differ for natural watersheds (non-urbanized) and for urban drainage systems.

a) Natural watersheds: Obtain T_c from the natural watershed nomograph.

b) Urban drainage systems: In the case of urban drainage systems, the time of concentration at any point within the drainage area is given by:

$T_c = T_i + T_f$ where

T_i is the inlet time or the time required for the storm water to flow to the first inlet in the system. It is the sum of time in overland flow across lots and in the street gutter.

T_f is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question.

Travel Time, T_f, is computed by dividing the length of storm drain by the computed flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm drain.

The overland flow component of inlet time, T_i, may be estimated by the use of the Urban Areas Overland Time of Flow Curves.

Rainfall Intensity, I

Using the computed time of concentration and 6-hour precipitation, the rainfall intensity can be obtained from the Intensity - Duration Chart (see Appendix A).

The rational method calculations were performed using Advanced Engineering Software (AES) RATSCx 2008 program, version 15.0. The model output is provided in Appendix B of this report. The model was developed from the drainage boundaries and points of storm flow concentration shown on the Hydrology Maps (Appendix C). These were determined using the grading/improvement plans and two-foot contour data.

3.2 Storm Frequency

Per the requirements of the San Diego County Hydrology Manual, this study used the 100-year frequency storm. The 100-year, six-hour rainfall amount of 3.6 inches was selected from the rainfall isopluvial map shown in Appendix A.

3.3 Access Road Hydrology – Alternate Methodology

The access road to the substation pad will have several culvert crossings constructed to convey runoff under the road from north to south to keep the natural drainage course. In an effort to be more efficient, Nolte used an alternate methodology to determine the 100-year flows for sizing the proposed culvert crossings. Nolte delineated the overall drainage basins discharging to each culvert. The basins were grouped together by relative size and slope. Then, a few select basins from each group were delineated and flows calculated using the Modified Rational Method described above. The results indicated a cfs per acre ranging from 1.8 to 2.0. Depending on the drainage basin group, Nolte applied the cfs/acre ratio to the other basins that contribute runoff to the proposed access road. These flows were used to size the culvert crossings.

4. SUMMARY

4.1 Substation Hydrology Results

Existing Conditions

The proposed Suncrest substation is located approximately six miles east of the unincorporated community of Alpine within San Diego County, California and impacts four undeveloped drainage basins. Basin 100 has a contributing area of 57.5 acres, Basin 200 has a contributing area of 89.1 acres, Basin 300 is 43.7 acres and Basin 400 is 6.0 acres. All four basins have natural drainage channels which drain in the southwest direction.

Proposed Conditions

Basin 100 is located on the north side of the proposed substation. Runoff from the proposed grading and the proposed access road within Basin 100 is routed through a series of storm drain pipes which is ultimately captured by a detention basin within Basin 100. The runoff from the remaining area of Basin 100, which will not be disturbed by the substation, drains naturally or is routed through a "bypass" storm drain system which discharges at a point downstream of the proposed detention basin.

Basin 200 is located on the southeast side of the proposed substation. Runoff from the proposed grading and substation pad within Basin 200 is also routed through a storm drain system which drains to a detention basin within Basin 200. The area of Basin 200 which is not affected by the proposed substation, will drain naturally.

Basin 300 is located at the center of the proposed substation, and similar to Basin 200, all runoff from the proposed site within Basin 300 is routed through a storm drain system into a detention basin within Basin 300. Runoff from the remaining portion of Basin 300 remains undisturbed.

Basin 400 is on the southwest side of the proposed substation and is minimally affected by grading for a proposed pad for a transmission tower. Basin 400 does not include a storm drain system and the entire basin drains naturally.

Table 1 summarizes the peak 100-year flows for existing and proposed conditions. The proposed flows in the table reflect post-detention conditions that are necessary to mitigate for increases in peak flows that discharge from the site.

Table 1: Basin Summary; 100-Year Discharge (Q) (cfs), and Area (acres)

Site Condition	Basin 100		Basin 200		Basin 300		Basin 400	
	Q	Area	Q	Area	Q	Area	Q	Area
Existing	85.2	57.5	165.7	89.1	71.7	43.7	11.7	6.0
Proposed	84.7	63.2	165.7	91.0	63.1	41.3	11.3	5.8

4.2 Access Road Hydrologic Results

In addition to the substation site, a 2.8-mile road provides access to the proposed substation. This access road begins east of the proposed substation at Japatul Valley Road, and connects at the northeast corner of the proposed substation, impacting several major drainage basins that drain towards the proposed access road. Culverts will be installed at several locations along the access road to allow existing channels to drain under the proposed access road. Approximately 0.4 miles of this access road is part of Basin 100 and is included in Basin 100's hydrologic analysis. The Culvert and Rip Rap Sizing Summary Table located in Appendix B if this report provides the flows and tributary areas to size the proposed culvert crossings. Section 3.3 of this report explains the methodology used to determine the quantity of flows. Appendix B has the rational method calculations for the computed drainage basins (Basins 500, 600, 700, 800, 900, 1000). The Proposed Access Road Hydrology Map is located in Appendix C.

4.3 Substation Hydraulic Results

Hydrologic Basins 100, 200, and 300 each contain detention basins that capture runoff from the proposed site to attenuate downstream flow. Detention basins 100 and 300 have rectangular risers and detention basin 200 has a circular riser that discharge flow in a manner which maintains the natural drainage path. Additionally, each detention basin contains an emergency riser that is designed to help drain the basin in the event of failure of the primary riser outlet system.

The detention basin within Basin 100 is located near the northwest side of the proposed substation and captures runoff from approximately 22.5 acres. The detention basin located within Basin 200 is located on the southeast side of the substation and captures runoff from 2.7 acres of the proposed site. Finally, the third detention basin, located within Basin 300, is situated on the southwest side of the proposed site and has 30.0 acres of tributary drainage area.

The detention basin analyses are primarily comprised of three data types; the inflow hydrograph, stage-storage relationship of the basin, and the outflow rating curve. Using this input data, storage calculations were performed using Bentley Haestad PondPack, Version 10.0 (PondPack).

Detention Basin Analyses

Inflow Hydrograph

Peak discharge volumes and time of concentrations for runoff draining into each detention basin were calculated using AES (see Section 4.1). Inflow hydrographs were generated for each detention basin using the County of San Diego's RatHydro program. The RatHydro program requires the following input (obtained from Nolte's Rational Method analyses in AES) in order to generate a Rational Method Hydrograph:

- Rational Method Time of Concentration (min.)
- 6-Hour Rainfall (inches)
- Basin Area (acres)

- Rational Method Runoff Coefficient
- Peak Discharge (cfs)

Stage-Storage Relationship

Volumes are represented by specifying an area (acres) for each contour of the proposed detention basin. PondPack interpolates linearly between these contours to compute the available storage volume.

Outflow Rating Curve

As previously mentioned, the risers within detention basins 100 and 300 are rectangular and the riser within detention basin 200 is circular. A majority of the flow enters the risers via weir flow or orifice flow through the top. However, orifices along the side of the risers also serve to help drain the basin under low flow conditions. The risers in detention basin 100 and 300 have three six-inch orifices located at the invert of the riser and 1.5 and 2.5 feet above the invert. Detention basin 200 has a 2-inch orifice at the riser invert and a 6-inch orifice 2.5 feet above the invert. Table 3 summarizes the primary riser configurations for the proposed detention basins.

Table 3: Riser Configurations

Riser Data	**Detention Basin 100**	**Detention Basin 200**	**Detention Basin 300**
Top Dimensions	5' x 4'	2' Diameter	5' x 4'
Height (ft)	5.5	5.5	5.5
Perforation Area/Row(ft^2)	0.20	0.02/0.20	0.20

Both weir and orifice equations were used to calculate flow through the top of the riser. The more conservative discharge value (lowest value) was used in the rating curves.

The orifice equation was used to determine the flow through the perforations at given water surface elevations (WSEL) and for flow through the top of the riser for circumstances when the WSEL exceeds the top of the riser:

Orifice Equation: $Q = Ca\sqrt{(2gh)}$

where:

C Orifice Coefficient, 0.6

a Total open area per row of perforations or through top of riser (ft^2)

g Acceleration due to gravity (32.2 ft/sec^2)

h Total head above perforation row or top of riser (ft)

The weir equation is used for flow through the top of riser when the head is above the riser.

Weir Equation: $Q=CLH^{3/2}$

where:

C Weir Coefficient, varies depending upon H/R ratio

L Perimeter at top of riser (ft)

H Total head above top of riser (ft)

Table 4 summarizes the outflow (assuming 50% blockage), maximum ponded WSEL, and volume of each respective detention basin at the 100-year ponded WSEL. See Appendix B for summary input and output from the detention basin analyses.

Table 4: Detention Basin Summary

PondPack Results	Detention Basin 100	Detention Basin 200	Detention Basin 300
100-Year Outflow (cfs)	18.20	0.94	47.66
100-Year Peak WSEL (ft)	3016.12	3048.39	2965.78
Volume (ac-ft)	2.340	0.204	2.226
Volume (ft^3)	101,930	8,886	96,965

Culvert Calculations

It was also necessary to verify that the outlet pipe has greater hydraulic capacity than the riser. This was accomplished by analyzing the outlet pipe as a culvert and comparing the calculated headwater elevation of the culvert to the peak WSEL of the detention basin (determined by the detention analyses). All culverts were analyzed as circular HDPE pipes with a roughness coefficient of 0.012. Table 5 summarizes the culvert diameters and calculated headwater elevations and illustrates that the outlet pipes for each respective detention basin have adequate capacity to convey the design discharge.

Table 5: Culvert Calculations

Culvert Results	Detention Basin 100	Detention Basin 200	Detention Basin 300
Culvert Diameter (ft)	3	1.5	3
Headwater Elevation (ft)	3006.15	3038.53	2957.12

4.4 Access Road Hydraulic Results

Culvert Calculations

CulvertMaster was used to determine adequate culvert sizes for all but two culvert crossings under the proposed access road. Input criteria for culvert analyses consisted of the discharge of

the culvert (peak 100-year flows of each basin), maximum allowable headwater (the edge of the proposed access road at the culvert crossing which would not allow water to overtop the road), and the tailwater elevation (determined as previously mentioned in Substation Hydraulics).

Basin 600 has culvert crossings at two locations; stations 115+38 and 120+15. At station 120+15, there is a natural channel draining to the northwest that crosses the proposed access road. After crossing the access road, the channel changes direction to the west, where it confluences with an additional channel within Basin 600. Downstream of this confluence, the channel drains in the southwest direction to cross the proposed access road a second time at station 115+38. HEC-RAS (Version 4.0) models were created for each of these culvert crossings to determine adequate culvert sizes. HEC-RAS models for Basin 600 included cross sections at a minimum of 100 feet upstream and downstream from the culvert at approximately 50-foot intervals, a coefficient of roughness of 0.05, and the peak 100-year discharge values determined by Rational Method analyses. The Culvert and Rip Rap Sizing Summary Table located in Appendix B lists the culvert sizes for each proposed crossing.

Rip Rap Calculations

Rip Rap Energy Dissipators will be placed at each culvert outlet per San Diego Regional Standard Drawing Number D-40. The purpose is to reduce the chances of runoff eroding the soil at each outlet, which can cause the culvert to shift over time. Rip rap calculations for each culvert are included in Appendix B in the Culvert and Rip Rap Sizing Summary Table.

4.5 Hydromodification Results

The San Diego County Municipal Permit (Order No. R9-2007-0001) was updated in January 2007 to include hydromodification criteria. While the County of San Diego is in the process of developing a comprehensive plan, Interim Hydromodification Criteria (IHC) have been established for those projects disturbing 50 acres or more. The purpose of IHC is to prevent development-related changes in storm water runoff from causing, or further accelerating, stream channel erosion or other adverse impacts to beneficial stream uses. Hydromodification aims to reduce erosion caused, not by the 100-year storm event that is typically used as the basis of design, but rather the steady flows of the more common smaller storms. IHC requires the analysis of historical rainfall data, usually spanning 35 years or more. By utilizing historical rain gauge data from a minimum of 35 years in the region, the hydromodification goal is to maintain the flow between 20 percent of the 5-year flow event and the 10-year flow event to within a ten percent interval from the pre-project to the mitigated land scenario. Nolte used a continuous simulation modeling software known as San Diego Hydrology Model (SDHM) created by Clear Creek Solutions, Inc. in order to model the Suncrest Substation. The SDHM was used to support the sizing of the three detention basins and their outlet structures that will be part of the proposed development. The SDHM output file can be found in Appendix B in the Hydraulic Calculations.

5. REFERENCES

AES Advanced Engineering Software, Rational Method Hydrology System Model, April 2008.

Haestad Methods, Inc., StormCAD v8i, November 2008.

Haestad Methods, Inc., FlowMaster, August 2008.

Haestad Methods, Inc., CulvertMaster v3.2, August 2008.

Haestad Methods, Inc., PondPack, v10.0, August 2008.

County of San Diego and Rick Engineering Company, RatHydro Program, January 2001.

U.S. Army Corps of Engineers, HEC-RAS 4.0.0, March 2008.

County of San Diego, Department of Public Works, Flood Control Section, San Diego County Hydrology Manual, June 2003

County of San Diego, Department of Public Works, Flood Control Section, San Diego County Drainage Design Manual, May 2005

Clear Creek Solutions, Inc., San Diego Hydrology Model, January 2008.

6. DECLARATION OF RESPONSIBLE CHARGE

I, hereby declare that I am the civil engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the Business and Professions Code, and that the design is consistent with current design.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

_____ _____

Scott Berkebile Date
RCE 66153, Exp. 06/30/10

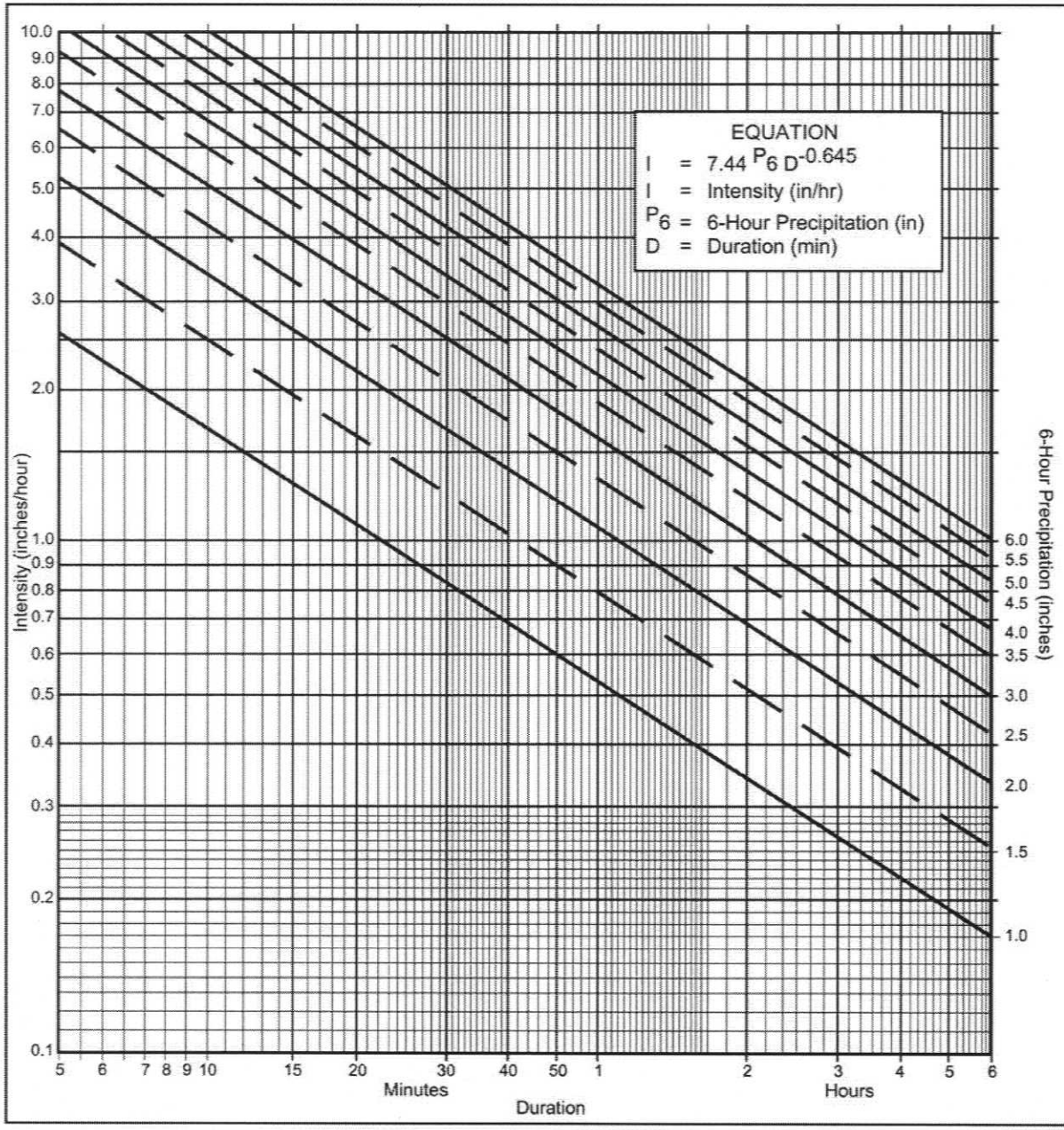
APPENDIX A: RATIONAL METHOD SUPPORTING TABLES AND FIGURES

Rainfall Intensity Duration Frequency Curves

Precipitation Map – 100-Year 6-Hour Isopluvials

Soil Hydrologic Groups Map

Runoff Coefficients



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency _____ year

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

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

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

Intensity-Duration Design Chart - Template

FIGURE 3-1

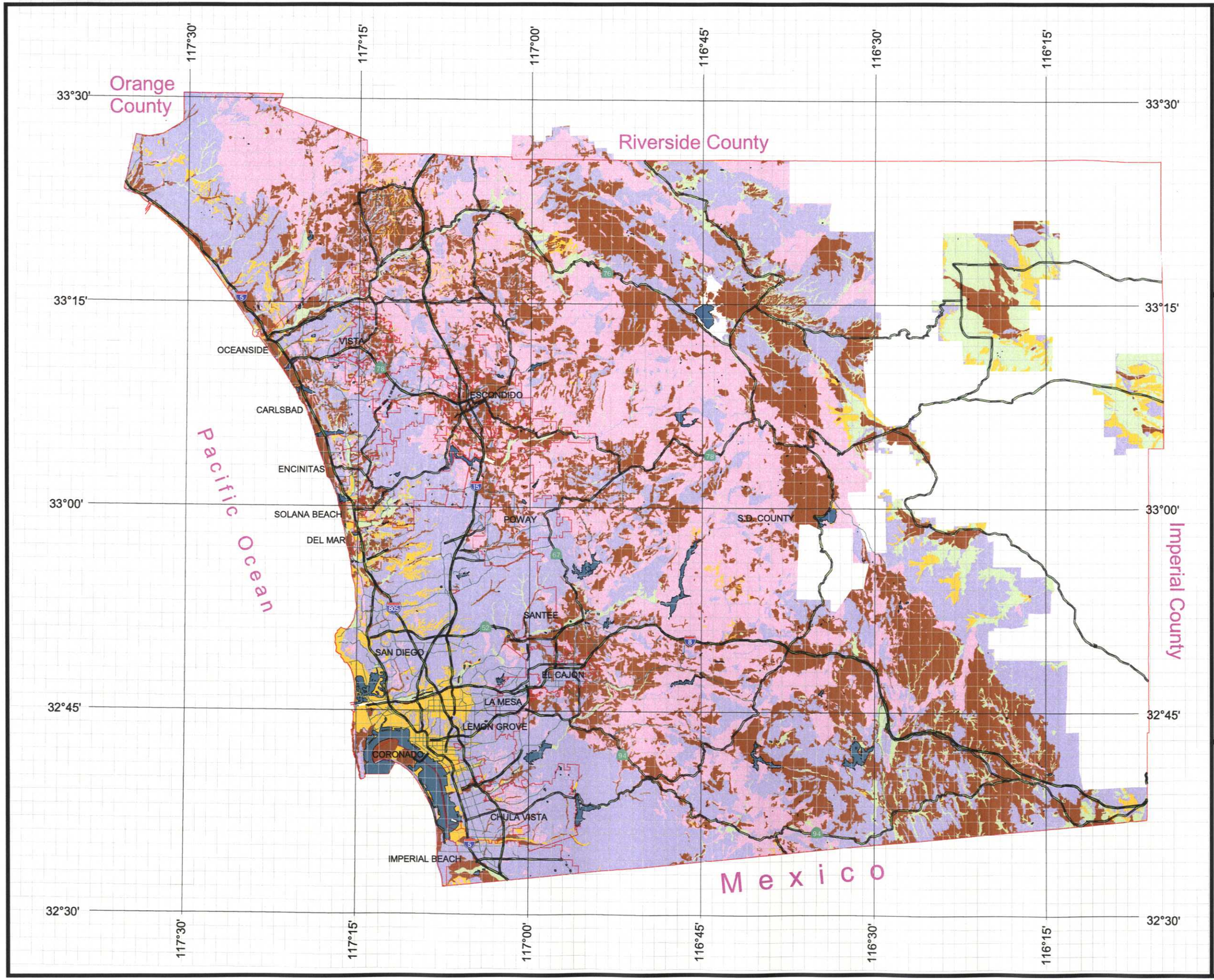
Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

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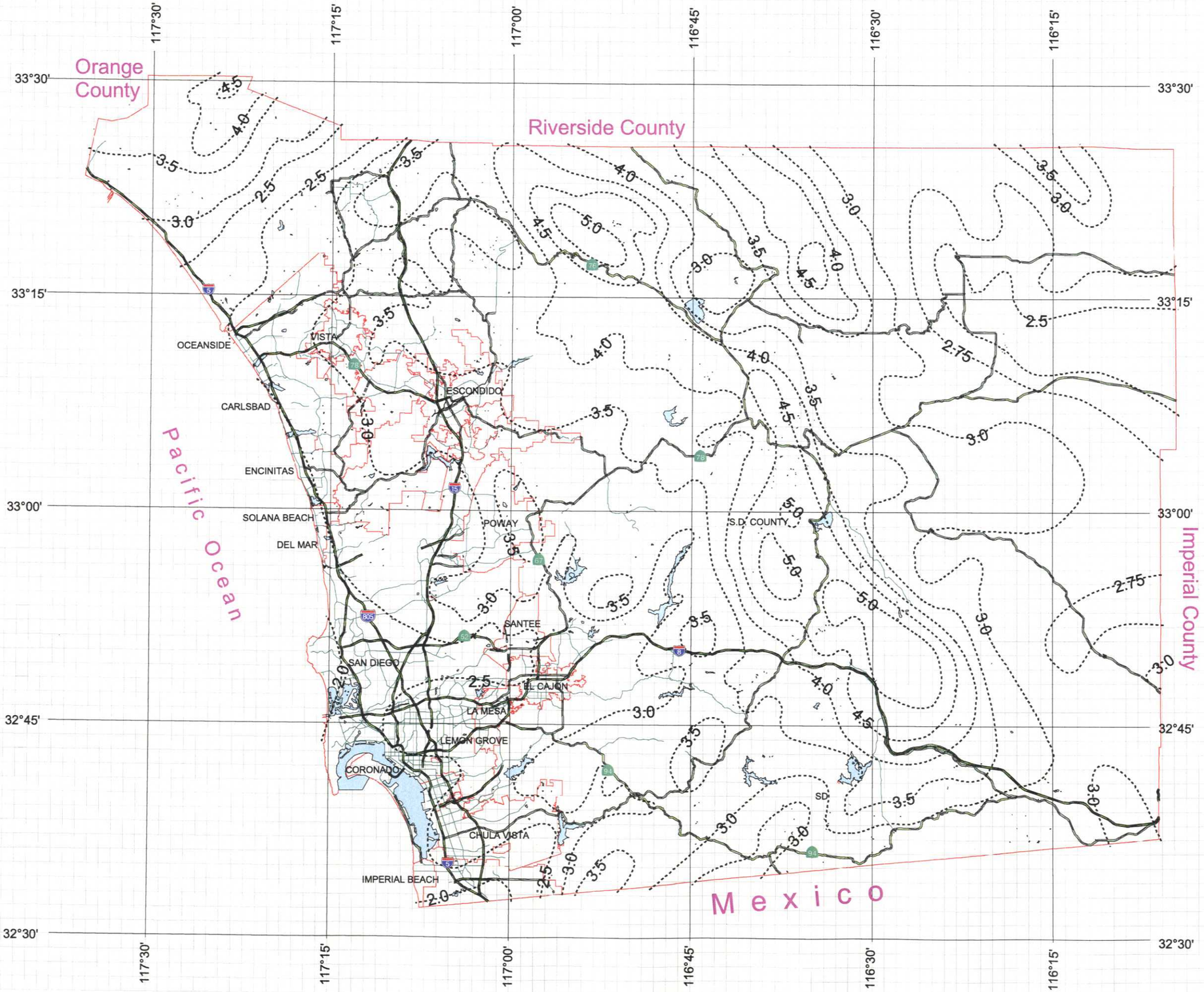
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)



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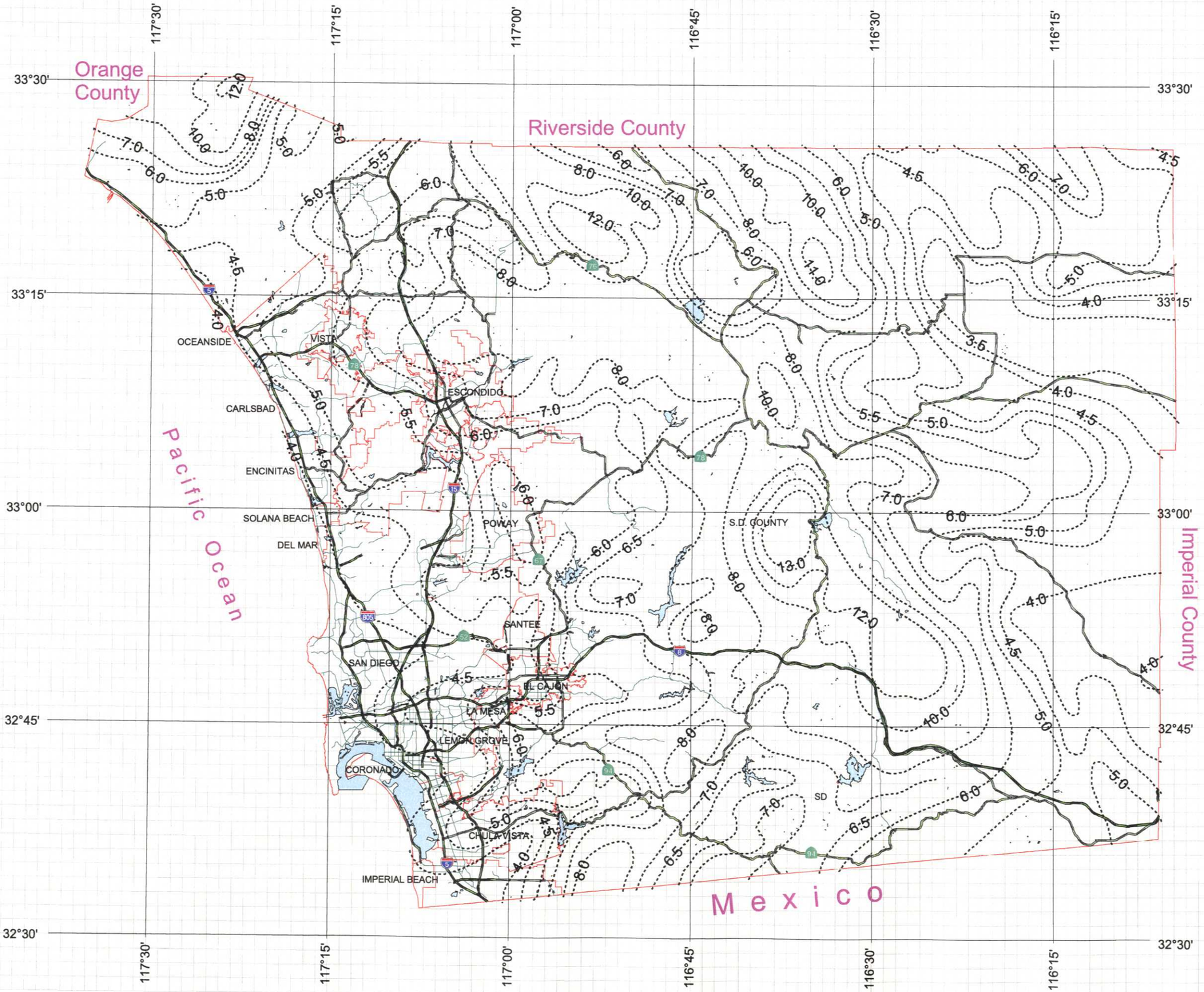
Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)



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APPENDIX B: CALCULATIONS

Weighted C Value Calculation Excel Spreadsheet

AES Rational Method Calculations

Hydraulic Calculations

HEC-RAS Calculations

Culvert and Rip Rap Sizing Summary Table

WEIGHTED C VALUE CALCULATION

Weighted C-Value Calculations

	Description	C-Value
A	Paved Street	0.95
B	Proposed Slope/Newly Graded Area	0.40
C	Substation Pad (Class II Base)	0.45
D	Natural (Undisturbed) Terrain	0.35

Basin 100							
Nodes		Total Sub-Area	A	B	C	D	$C_{Average}$
U/S	D/S	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	
100	101	0.10				0.1	0.35
101	102	0.88				0.88	0.35
102	103	0.86				0.86	0.35
103	104	1.83				1.83	0.35
105	105	0.26	0.09			0.17	0.56
151	151	0.88		0.22		0.66	0.36
156	151	3.01		0.67		2.34	0.36
160	161	0.07	0.07				0.95
161	162	0.06	0.06				0.95
162	163	0.19	0.19				0.95
163	164	0.40	0.40				0.95
164	165	0.08	0.08				0.95
165	167	0.32	0.25	0.07			0.83
166	166	1.59		1.59			0.40
167	168	N/A					N/A
170	171	0.04		0.04			0.40
171	172	0.10			0.10		0.45
172	173	0.34			0.34		0.45
173	174	N/A					N/A
175	174	0.51		0.05	0.46		0.45
176	176	0.24		0.01	0.23		0.45
176	169	N/A					N/A
169	178	0.69	0.34	0.17	0.18		0.68
178	179	0.84	0.12	0.23	0.49		0.51
179	180	0.61	0.19		0.42		0.61
180.5	180	1.00	0.11		0.89		0.51
180	181	0.62	0.11	0.02	0.49		0.54
181.5	181	0.97			0.97		0.45
181	182	0.33	0.10		0.23		0.60
183.5	183	0.57	0.11		0.46		0.55
183	184	N/A					N/A

	Description	C-Value
A	Paved Street	0.95
B	Proposed Slope/Newly Graded Area	0.40
C	Substation Pad (Class II Base)	0.45
D	Natural (Undisturbed) Terrain	0.35

Basin 100							
Nodes		Total Sub-Area	A	B	C	D	$C_{Average}$
U/S	D/S	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	
185	186	0.11			0.11		0.45
186	187	0.12			0.12		0.45
187	188	0.77			0.77		0.45
188	189	0.56	0.35		0.21		0.76
189	190	0.85	0.25		0.60		0.60
190.5	190	0.79			0.79		0.45
190	191	1.51	0.13		1.38		0.49
191	192	1.51	0.21		1.30		0.52
192	193	1.46	0.12		1.34		0.49
193	184	N/A					N/A
194	195	0.15	0.03	0.05	0.07		0.53
195	196	0.23	0.04		0.20		0.53
196	197	0.36	0.07	0.29			0.51
197	198	N/A					N/A
198	199	N/A					N/A
199.1	199.0	0.86	0.28		0.58		0.61
199	184.0	N/A					N/A
184	199.2	N/A					N/A
199.2	199.3	N/A					N/A
199.3	199.4	N/A					N/A
199.4	199.4	1.37		1.37			0.40
199.5	199.5	0.34		0.34			0.40

	Description	C-Value
A	Paved Street	0.95
B	Proposed Slope/Newly Graded Area	0.40
C	Substation Pad (Class II Base)	0.45
D	Natural (Undisturbed) Terrain	0.35

Basin 200							
Nodes		**Total Sub-Area**	**A**	**B**	**C**	**D**	$C_{Average}$
U/S	**D/S**	**(Acres)**	**(Acres)**	**(Acres)**	**(Acres)**	**(Acres)**	
208	210	0.11			0.11		0.45
210	212	0.17			0.17		0.45
212	218	0.77		0.23	0.54		0.44
218	220	0.92		0.12	0.80		0.44
224	226	0.05		0.05			0.40
226	228	0.09		0.02	0.07		0.44
228	230	0.22			0.22		0.45
232	234	0.36	0.03	0.33			0.45

	Description	C-Value
A	Paved Street	0.95
B	Proposed Slope/Newly Graded Area	0.40
C	Substation Pad (Class II Base)	0.45
D	Natural (Undisturbed) Terrain	0.35

Basin 300							
Nodes		**Total Sub-Area**	**A**	**B**	**C**	**D**	$C_{Average}$
U/S	**D/S**	**(Acres)**	**(Acres)**	**(Acres)**	**(Acres)**	**(Acres)**	
300	301	0.11		0.11			0.40
301	302	0.04		0.02	0.02		0.43
302	303	0.38		0.30	0.08		0.41
303	304	0.79		0.06	0.73		0.45
304	305	N/A					N/A
306	305	0.49		0.49			0.40
305	307	0.78	0.05	0.23	0.5		0.47
307	308	0.95	0.20		0.75		0.56
308.5	308	0.68	0.14		0.54		0.55
308	309	1.24	0.21		1.03		0.53
310	311	0.11			0.11		0.45
311	312	0.12			0.12		0.45
312	313	1.00	0.11		0.89		0.51
313	309	N/A					N/A
309	314	1.23	0.21		1.02		0.54
315	316	0.11			0.11		0.45
316	317	0.13			0.13		0.45
317	318	0.98			0.98		0.45
318	319	1.22			1.22		0.45
320	319	1.17			1.17		0.45
319	314	N/A					N/A
322	323	0.11			0.11		0.45
323	324	0.12			0.12		0.45
324	325	1.00	0.11		0.89		0.51
325	314	N/A					N/A
314	326	0.76	0.20	0.21	0.35		0.57
328	329	0.08		0.08			0.40
329	330	0.14		0.14			0.40
330	331	N/A					N/A
331	326	N/A					N/A
326	332	0.78	0.11	0.20	0.47		0.51
332	333	N/A					N/A
333	335	0.55	0.10	0.03	0.42		0.54
335	336	0.46	0.09		0.37		0.55
336	337	0.46	0.08		0.38		0.54
345	346	0.11			0.11		0.45
346	347	0.21			0.21		0.45

	Description	C-Value
A	Paved Street	0.95
B	Proposed Slope/Newly Graded Area	0.40
C	Substation Pad (Class II Base)	0.45
D	Natural (Undisturbed) Terrain	0.35

Basin 300							
Nodes		**Total Sub-Area**	**A**	**B**	**C**	**D**	**$C_{Average}$**
U/S	**D/S**	**(Acres)**	**(Acres)**	**(Acres)**	**(Acres)**	**(Acres)**	
347	348	1.19			1.19		0.45
348	349	1.56			1.56		0.45
349	350	N/A					N/A
351	350	0.70		0.02	0.68		0.45
350	354	N/A					N/A
355	354	0.73	0.13		0.60		0.54
358	359	0.10			0.10		0.45
359	360	0.18	0.02		0.16		0.51
360	361	0.81	0.09		0.72		0.51
361	362	0.99	0.09		0.90		0.50
362	354	N/A					N/A
355	354	0.73	0.12		0.61		0.53
354	363	N/A					N/A
364	363	0.73	0.19		0.54		0.58
365	367	0.10			0.10		0.45
367	368	0.18	0.02		0.16		0.51
368	369	0.81	0.08		0.73		0.50
369	370	0.99	0.09		0.9		0.50
370	363	N/A					N/A
363	337	N/A					N/A
337	371	N/A					N/A
371	372	N/A					N/A
372	373	0.78		0.78			0.40
373	374	1.17		1.17			0.40
374	376	N/A					N/A
376	378	2.14		2.14			0.40

AES RATIONAL METHOD CALCULATIONS

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* 11-11-2009                                                             *
* EXISTING HYDROLOGY BASIN 100                                           *
*                                                                        *
 **************************************************************************

  FILE NAME: EX100.DAT
  TIME/DATE OF STUDY: 10:59 11/11/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3395.00
  DOWNSTREAM ELEVATION(FEET) =   3357.00
  ELEVATION DIFFERENCE(FEET) =     38.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3357.00  DOWNSTREAM(FEET) =   3276.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   198.00   CHANNEL SLOPE =  0.4091
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2151 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.29
  FLOW VELOCITY(FEET/SEC) =   2.60 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    7.54
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.279
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    2.24
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.50
  TC(MIN.) =    7.54

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3276.00  DOWNSTREAM(FEET) =   3169.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   400.00   CHANNEL SLOPE =  0.2675
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1858 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.50
  FLOW VELOCITY(FEET/SEC) =   3.27 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.04   Tc(MIN.) =    9.57
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     698.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.239
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.86   SUBAREA RUNOFF(CFS) =    1.88
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.02
  TC(MIN.) =    9.57

****************************************************************************
  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) =   3169.00  DOWNSTREAM(FEET) =   3136.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00   CHANNEL SLOPE =  0.0943
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.547
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.05
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   1.91
  Tc(MIN.) =   11.49
  SUBAREA AREA(ACRES) =     3.18       SUBAREA RUNOFF(CFS) =    6.17
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        5.0         PEAK FLOW RATE(CFS) =       9.75
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   3.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1048.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3136.00  DOWNSTREAM(FEET) =   3116.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   259.00   CHANNEL SLOPE =  0.0772
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.210
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      14.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.68
  AVERAGE FLOW DEPTH(FEET) =   0.35   TRAVEL TIME(MIN.) =   1.17
  Tc(MIN.) =   12.66
  SUBAREA AREA(ACRES) =     5.68       SUBAREA RUNOFF(CFS) =   10.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.7         PEAK FLOW RATE(CFS) =      19.51

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.40   FLOW VELOCITY(FEET/SEC.) =   4.05
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =    1307.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3116.00  DOWNSTREAM(FEET) =   3034.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   864.00   CHANNEL SLOPE =  0.0949
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.606
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      38.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.41
  AVERAGE FLOW DEPTH(FEET) =   0.56   TRAVEL TIME(MIN.) =   2.66
  Tc(MIN.) =   15.32
  SUBAREA AREA(ACRES) =    23.80       SUBAREA RUNOFF(CFS) =   38.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       34.5         PEAK FLOW RATE(CFS) =      55.62

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.68   FLOW VELOCITY(FEET/SEC.) =   6.06
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    2171.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3034.00  DOWNSTREAM(FEET) =   2962.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   822.00   CHANNEL SLOPE =  0.0876
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.235
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      72.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.43
  AVERAGE FLOW DEPTH(FEET) =   0.81   TRAVEL TIME(MIN.) =   2.13
  Tc(MIN.) =   17.45
```

```
  SUBAREA AREA(ACRES) =    22.97       SUBAREA RUNOFF(CFS) =   34.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       57.5         PEAK FLOW RATE(CFS) =      85.18

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.88   FLOW VELOCITY(FEET/SEC.) =   6.72
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    2993.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       57.5  TC(MIN.) =     17.45
  PEAK FLOW RATE(CFS)   =      85.18
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* 11-11-2009                                                             *
* EXISTING HYDROLOGY BASIN 200                                           *
*                                                                        *
 **************************************************************************

  FILE NAME: EX200.DAT
  TIME/DATE OF STUDY: 10:56 11/11/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3277.00
  DOWNSTREAM ELEVATION(FEET) =   3262.00
  ELEVATION DIFFERENCE(FEET) =     15.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      0.72

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3262.00  DOWNSTREAM(FEET) =   3207.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   148.00   CHANNEL SLOPE =  0.3716
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2090 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.72
  FLOW VELOCITY(FEET/SEC) =   2.56 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.96   Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     248.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.477
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.63   SUBAREA RUNOFF(CFS) =    1.65
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.30
  TC(MIN.) =    7.23

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3207.00  DOWNSTREAM(FEET) =   3170.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.1721
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1460 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.30
  FLOW VELOCITY(FEET/SEC) =   2.83 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    8.50
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     463.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.737
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.42   SUBAREA RUNOFF(CFS) =    3.35
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       5.42
  TC(MIN.) =    8.50

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3170.00  DOWNSTREAM(FEET) =   3132.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   208.00   CHANNEL SLOPE =  0.1827
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.42
  FLOW VELOCITY(FEET/SEC) =   6.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.51   Tc(MIN.) =    9.01
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     671.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.488
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.36   SUBAREA RUNOFF(CFS) =    5.36
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      10.58
  TC(MIN.) =    9.01

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3132.00  DOWNSTREAM(FEET) =   3050.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   335.00   CHANNEL SLOPE =  0.2448
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      10.58
  FLOW VELOCITY(FEET/SEC) =   8.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.70   Tc(MIN.) =    9.70
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =    1006.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.184
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.68   SUBAREA RUNOFF(CFS) =   23.12
  TOTAL AREA(ACRES) =       15.3   TOTAL RUNOFF(CFS) =      33.20
  TC(MIN.) =    9.70

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3050.00  DOWNSTREAM(FEET) =   3002.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   431.00   CHANNEL SLOPE =  0.1114
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      33.20
  FLOW VELOCITY(FEET/SEC) =  10.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.66   Tc(MIN.) =   10.36
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1437.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.927
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   26.24   SUBAREA RUNOFF(CFS) =   54.44
  TOTAL AREA(ACRES) =       41.6   TOTAL RUNOFF(CFS) =      86.26
  TC(MIN.) =   10.36

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    207.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3002.00  DOWNSTREAM(FEET) =   2952.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   430.00   CHANNEL SLOPE =  0.1163
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      86.26
  FLOW VELOCITY(FEET/SEC) =  14.36 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.50   Tc(MIN.) =   10.86
```

```
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =    1867.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    206.00 TO NODE    207.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.750
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
 SUBAREA AREA(ACRES) =   14.07   SUBAREA RUNOFF(CFS) =   28.32
 TOTAL AREA(ACRES) =       55.7   TOTAL RUNOFF(CFS) =     112.00
 TC(MIN.) =   10.86

****************************************************************************
 FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   2952.00  DOWNSTREAM(FEET) =   2540.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =  1318.00   CHANNEL SLOPE =  0.3126
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =     112.00
 FLOW VELOCITY(FEET/SEC) =  15.53 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.41   Tc(MIN.) =   12.28
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    208.00 =    3185.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    207.00 TO NODE    208.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.314
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
 SUBAREA AREA(ACRES) =   33.43   SUBAREA RUNOFF(CFS) =   62.17
 TOTAL AREA(ACRES) =       89.1   TOTAL RUNOFF(CFS) =     165.67
 TC(MIN.) =   12.28
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       89.1  TC(MIN.) =     12.28
 PEAK FLOW RATE(CFS)   =     165.67
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* EXISTING HYDROLOGY BASIN 300                                            *
*                                                                         *
 *************************************************************************

  FILE NAME: EX300.DAT
  TIME/DATE OF STUDY: 16:09 11/11/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3302.00
  DOWNSTREAM ELEVATION(FEET) =   3258.00
  ELEVATION DIFFERENCE(FEET) =     44.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.17

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3258.00  DOWNSTREAM(FEET) =   3169.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.4140
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2157 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.17
  FLOW VELOCITY(FEET/SEC) =   2.60 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.38   Tc(MIN.) =    7.64
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     315.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.213
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.17   SUBAREA RUNOFF(CFS) =    0.43
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.58
  TC(MIN.) =    7.64

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3169.00  DOWNSTREAM(FEET) =   3138.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   101.00   CHANNEL SLOPE =  0.3069
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1967 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.58
  FLOW VELOCITY(FEET/SEC) =   2.48 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.68   Tc(MIN.) =    8.32
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     416.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.828
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  92
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5743
  SUBAREA AREA(ACRES) =    0.38   SUBAREA RUNOFF(CFS) =    1.84
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.39
  TC(MIN.) =    8.32

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3138.00  DOWNSTREAM(FEET) =   3079.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   378.00   CHANNEL SLOPE =  0.1561
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1380 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.39
  FLOW VELOCITY(FEET/SEC) =   2.78 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.26   Tc(MIN.) =   10.59
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     794.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.847
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4309
  SUBAREA AREA(ACRES) =    1.08   SUBAREA RUNOFF(CFS) =    2.21
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       4.26
  TC(MIN.) =   10.59

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3079.00  DOWNSTREAM(FEET) =   3062.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   222.00   CHANNEL SLOPE =  0.0766
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0766 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.26
  FLOW VELOCITY(FEET/SEC) =   2.51 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.47   Tc(MIN.) =   12.06
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    305.00 =    1016.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.375
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3790
  SUBAREA AREA(ACRES) =    3.02   SUBAREA RUNOFF(CFS) =    5.68
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =       9.60
  TC(MIN.) =   12.06

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3062.00  DOWNSTREAM(FEET) =   3044.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   230.00   CHANNEL SLOPE =  0.0783
  CHANNEL FLOW THRU SUBAREA(CFS) =       9.60
  FLOW VELOCITY(FEET/SEC) =   6.92 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.55   Tc(MIN.) =   12.61
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    306.00 =    1246.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    306.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.222
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3611
  SUBAREA AREA(ACRES) =    7.57   SUBAREA RUNOFF(CFS) =   13.83
  TOTAL AREA(ACRES) =       12.3   TOTAL RUNOFF(CFS) =      23.16
  TC(MIN.) =   12.61

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    307.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3044.00  DOWNSTREAM(FEET) =   2974.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   621.00   CHANNEL SLOPE =  0.1127
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      23.16
```

```
  FLOW VELOCITY(FEET/SEC) =   9.86 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.05   Tc(MIN.) =   13.66
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    307.00 =    1867.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    307.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.959
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3564
  SUBAREA AREA(ACRES) =    9.25   SUBAREA RUNOFF(CFS) =   16.06
  TOTAL AREA(ACRES) =       21.5   TOTAL RUNOFF(CFS) =      38.05
  TC(MIN.) =   13.66

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2974.00  DOWNSTREAM(FEET) =   2916.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   656.00   CHANNEL SLOPE =  0.0884
  CHANNEL FLOW THRU SUBAREA(CFS) =      38.05
  FLOW VELOCITY(FEET/SEC) =  10.64 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.03   Tc(MIN.) =   14.69
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    308.00 =    2523.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.733
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3539
  SUBAREA AREA(ACRES) =   13.18   SUBAREA RUNOFF(CFS) =   21.83
  TOTAL AREA(ACRES) =       34.7   TOTAL RUNOFF(CFS) =      58.14
  TC(MIN.) =   14.69

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    309.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2916.00  DOWNSTREAM(FEET) =   2868.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   311.00   CHANNEL SLOPE =  0.1543
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      58.14
  FLOW VELOCITY(FEET/SEC) =  12.79 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.41   Tc(MIN.) =   15.10
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    309.00 =    2834.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    309.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.650
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3531
  SUBAREA AREA(ACRES) =    8.99   SUBAREA RUNOFF(CFS) =   14.63
  TOTAL AREA(ACRES) =       43.7   TOTAL RUNOFF(CFS) =      71.76
  TC(MIN.) =   15.10
============================================================================
  END OF STUDY SUMMARY:
```

```
                                          EX300.RES
  TOTAL AREA(ACRES)     =       43.7  TC(MIN.) =     15.10
  PEAK FLOW RATE(CFS)   =      71.76
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* 01-09-2009                                                             *
* EXISTING HYDROLOGY BASIN 400                                           *
*                                                                        *
 **************************************************************************

  FILE NAME: SDGEE400.DAT
  TIME/DATE OF STUDY: 08:03 01/12/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   2979.00
  DOWNSTREAM ELEVATION(FEET) =   2962.00
  ELEVATION DIFFERENCE(FEET) =     17.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.26

**************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2962.00  DOWNSTREAM(FEET) =   2924.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   147.00   CHANNEL SLOPE =  0.2585
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1828 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.26
  FLOW VELOCITY(FEET/SEC) =   2.39 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =    7.29
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     247.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.437
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.28   SUBAREA RUNOFF(CFS) =    0.73
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.96
  TC(MIN.) =    7.29

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2924.00  DOWNSTREAM(FEET) =   2784.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   243.00   CHANNEL SLOPE =  0.5761
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2288 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.96
  FLOW VELOCITY(FEET/SEC) =   2.68 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.51   Tc(MIN.) =    8.80
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     490.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.586
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.03   SUBAREA RUNOFF(CFS) =    2.37
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       3.23
  TC(MIN.) =    8.80

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2784.00  DOWNSTREAM(FEET) =   2671.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   177.00   CHANNEL SLOPE =  0.6384
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2300 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.23
  FLOW VELOCITY(FEET/SEC) =   3.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.74   Tc(MIN.) =    9.55
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =     667.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.250
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.90   SUBAREA RUNOFF(CFS) =    4.16
  TOTAL AREA(ACRES) =        3.3   TOTAL RUNOFF(CFS) =       7.22
  TC(MIN.) =    9.55

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2671.00  DOWNSTREAM(FEET) =   2510.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   516.00   CHANNEL SLOPE =  0.3120
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1980 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.22
  FLOW VELOCITY(FEET/SEC) =   4.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.79   Tc(MIN.) =   11.33
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =    1183.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.596
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.67   SUBAREA RUNOFF(CFS) =    5.23
  TOTAL AREA(ACRES) =        6.0   TOTAL RUNOFF(CFS) =      11.69
  TC(MIN.) =   11.33
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        6.0  TC(MIN.) =     11.33
  PEAK FLOW RATE(CFS)   =      11.69
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-13-2009                                                              *
* FINAL HYDROLOGY: BASIN 100 OUTFALL                                      *
 **************************************************************************

  FILE NAME: PR100A.DAT
  TIME/DATE OF STUDY: 09:53 11/13/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3395.00
  DOWNSTREAM ELEVATION(FEET) =   3357.00
  ELEVATION DIFFERENCE(FEET) =     38.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

**************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3357.00  DOWNSTREAM(FEET) =   3276.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   198.00   CHANNEL SLOPE =  0.4091
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2151 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.29
  FLOW VELOCITY(FEET/SEC) =   2.60 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    7.54
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     298.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.279
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    2.24
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.50
  TC(MIN.) =    7.54

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3276.00  DOWNSTREAM(FEET) =   3169.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   400.00   CHANNEL SLOPE =  0.2675
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1858 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.50
  FLOW VELOCITY(FEET/SEC) =   3.27 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.04   Tc(MIN.) =    9.57
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     698.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.239
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.86   SUBAREA RUNOFF(CFS) =    1.88
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.02
  TC(MIN.) =    9.57

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3169.00  DOWNSTREAM(FEET) =   3146.24
  CHANNEL LENGTH THRU SUBAREA(FEET) =   332.80   CHANNEL SLOPE =  0.0684
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0684 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       4.02
  FLOW VELOCITY(FEET/SEC) =   2.33 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.38   Tc(MIN.) =   11.96
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =    1030.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.405
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.83   SUBAREA RUNOFF(CFS) =    3.46
  TOTAL AREA(ACRES) =        3.7   TOTAL RUNOFF(CFS) =       6.94
  TC(MIN.) =   11.96

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.405
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3639
  SUBAREA AREA(ACRES) =    0.26   SUBAREA RUNOFF(CFS) =    0.79
  TOTAL AREA(ACRES) =        3.9   TOTAL RUNOFF(CFS) =       7.73
  TC(MIN.) =   11.96

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3140.33  DOWNSTREAM(FEET) =  3127.66
  FLOW LENGTH(FEET) =   432.50   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.78
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.73
  PIPE TRAVEL TIME(MIN.) =   0.74    Tc(MIN.) =   12.69
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =    1463.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.201
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3569
  SUBAREA AREA(ACRES) =    4.02   SUBAREA RUNOFF(CFS) =    7.32
  TOTAL AREA(ACRES) =        7.9   TOTAL RUNOFF(CFS) =      14.75
  TC(MIN.) =   12.69

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3127.66  DOWNSTREAM(FEET) =  3107.98
  FLOW LENGTH(FEET) =   452.90   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.28
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.75
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =   13.26
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =    1916.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.056
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3540
  SUBAREA AREA(ACRES) =    5.73   SUBAREA RUNOFF(CFS) =   10.14
  TOTAL AREA(ACRES) =       13.7   TOTAL RUNOFF(CFS) =      24.48
  TC(MIN.) =   13.26

****************************************************************************
  FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3107.98  DOWNSTREAM(FEET) =  3090.99
  FLOW LENGTH(FEET) =   296.10   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.21
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.48
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   13.57
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =    2212.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.982
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3529
  SUBAREA AREA(ACRES) =    5.13   SUBAREA RUNOFF(CFS) =    8.95
  TOTAL AREA(ACRES) =       18.8   TOTAL RUNOFF(CFS) =      33.07
  TC(MIN.) =   13.57

****************************************************************************
  FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3090.99  DOWNSTREAM(FEET) =  3076.41
  FLOW LENGTH(FEET) =   299.50   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.51
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.07
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =   13.87
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =    2511.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.912
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3524
  SUBAREA AREA(ACRES) =    3.58   SUBAREA RUNOFF(CFS) =    6.15
  TOTAL AREA(ACRES) =       22.4   TOTAL RUNOFF(CFS) =      38.76
  TC(MIN.) =   13.87

****************************************************************************
  FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3076.41  DOWNSTREAM(FEET) =  3061.41
  FLOW LENGTH(FEET) =    34.20   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.6 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =  40.39
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.76
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   13.88
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =    2546.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.909
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3523
  SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    1.72
  TOTAL AREA(ACRES) =       23.4   TOTAL RUNOFF(CFS) =      40.45
  TC(MIN.) =   13.88

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.50 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3061.41  DOWNSTREAM(FEET) =  3052.85
  FLOW LENGTH(FEET) =    19.60   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  40.74
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      40.45
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   13.89
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.50 =    2565.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.50 TO NODE    110.50 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.907
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3527
  SUBAREA AREA(ACRES) =    0.18   SUBAREA RUNOFF(CFS) =    0.35
  TOTAL AREA(ACRES) =       23.6   TOTAL RUNOFF(CFS) =      40.79
  TC(MIN.) =   13.89

****************************************************************************
  FLOW PROCESS FROM NODE    110.50 TO NODE    111.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3052.85  DOWNSTREAM(FEET) =  3048.64
  FLOW LENGTH(FEET) =    13.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  35.62
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      40.79
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   13.90
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =    2579.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  13
----------------------------------------------------------------------------
```

```
 >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
================================================================================

********************************************************************************
 FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  21
--------------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
 UPSTREAM ELEVATION(FEET) =   3332.00
 DOWNSTREAM ELEVATION(FEET) =   3308.00
 ELEVATION DIFFERENCE(FEET) =     24.00
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
 SUBAREA RUNOFF(CFS) =      0.14
 TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.14

********************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  53
--------------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3308.00  DOWNSTREAM(FEET) =   3212.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   189.00   CHANNEL SLOPE =  0.5079
 SLOPE ADJUSTMENT CURVE USED:
 EFFECTIVE SLOPE = .2254 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       0.14
 FLOW VELOCITY(FEET/SEC) =   2.66 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.18   Tc(MIN.) =    7.45
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    114.00 =     289.00 FEET.

********************************************************************************
 FLOW PROCESS FROM NODE    113.00 TO NODE    114.00 IS CODE =  81
--------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.333
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
 SUBAREA AREA(ACRES) =    0.17   SUBAREA RUNOFF(CFS) =    0.44
 TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.56
 TC(MIN.) =    7.45

********************************************************************************
 FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  53
--------------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3212.00  DOWNSTREAM(FEET) =   3174.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   112.00   CHANNEL SLOPE =  0.3393
 SLOPE ADJUSTMENT CURVE USED:
 EFFECTIVE SLOPE = .2034 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =       0.56
 FLOW VELOCITY(FEET/SEC) =   2.53 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.74   Tc(MIN.) =    8.19
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    115.00 =     401.00 FEET.

********************************************************************************
 FLOW PROCESS FROM NODE    114.00 TO NODE    115.00 IS CODE =  81
--------------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.899
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
```

```
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.58
  TOTAL AREA(ACRES) =        0.5   TOTAL RUNOFF(CFS) =       1.11
  TC(MIN.) =    8.19

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3174.00  DOWNSTREAM(FEET) =   3155.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   154.60   CHANNEL SLOPE =  0.1229
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1169 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.11
  FLOW VELOCITY(FEET/SEC) =   1.98 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.30   Tc(MIN.) =    9.49
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    116.00 =     555.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    116.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.274
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.23   SUBAREA RUNOFF(CFS) =    2.70
  TOTAL AREA(ACRES) =        1.7   TOTAL RUNOFF(CFS) =       3.71
  TC(MIN.) =    9.49

****************************************************************************
  FLOW PROCESS FROM NODE    116.00 TO NODE    117.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3155.00  DOWNSTREAM(FEET) =   3105.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   652.90   CHANNEL SLOPE =  0.0766
  CHANNEL BASE(FEET) =    2.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.868
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       9.25
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  10.48
  AVERAGE FLOW DEPTH(FEET) =   0.29   TRAVEL TIME(MIN.) =   1.04
  Tc(MIN.) =   10.53
  SUBAREA AREA(ACRES) =     5.39       SUBAREA RUNOFF(CFS) =   11.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        7.1         PEAK FLOW RATE(CFS) =      14.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.37   FLOW VELOCITY(FEET/SEC.) =  12.09
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    117.00 =    1208.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    117.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.868
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.69   SUBAREA RUNOFF(CFS) =    1.42
  TOTAL AREA(ACRES) =        7.8   TOTAL RUNOFF(CFS) =      15.96
```

```
  TC(MIN.) =   10.53

****************************************************************************
  FLOW PROCESS FROM NODE    117.00 TO NODE    118.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3102.75  DOWNSTREAM(FEET) =   3056.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =    83.40   CHANNEL SLOPE =  0.5558
  CHANNEL BASE(FEET) =    2.50   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.847
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      16.76
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  24.41
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   0.06
  Tc(MIN.) =   10.59
  SUBAREA AREA(ACRES) =     0.69       SUBAREA RUNOFF(CFS) =    1.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.354
  TOTAL AREA(ACRES) =        8.5         PEAK FLOW RATE(CFS) =      17.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =  25.26
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    118.00 =    1291.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    118.00 TO NODE    119.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.42  DOWNSTREAM(FEET) =  3047.02
  FLOW LENGTH(FEET) =   101.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.78
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.52
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =   10.78
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    119.00 =    1393.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    119.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3047.02  DOWNSTREAM(FEET) =  3046.20
  FLOW LENGTH(FEET) =   107.20   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.10
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.52
  PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =   11.03
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    120.00 =    1500.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3046.20  DOWNSTREAM(FEET) =  3044.48
  FLOW LENGTH(FEET) =   288.60   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  17.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.56
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.52
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =   11.76
  LONGEST FLOWPATH FROM NODE    112.00 TO NODE    121.00 =    1789.40 FEET.

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

```
 FLOW PROCESS FROM NODE    121.00 TO NODE    111.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3044.48  DOWNSTREAM(FEET) =  3041.50
 FLOW LENGTH(FEET) =   298.50   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.94
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      17.52
 PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =   12.39
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    111.00 =    2087.90 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       17.52    12.39       5.283        8.46
 LONGEST FLOWPATH FROM NODE    112.00 TO NODE    111.00 =    2087.90 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1       40.79    13.90       4.905       23.57
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =    2579.30 FEET.

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      53.88      12.39        5.283
     2      57.06      13.90        4.905

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      57.06   Tc(MIN.) =   13.90
 TOTAL AREA(ACRES) =       32.0

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3041.50  DOWNSTREAM(FEET) =  3040.03
 FLOW LENGTH(FEET) =   239.21   MANNING'S N =  0.012
 DEPTH OF FLOW IN  39.0 INCH PIPE IS  28.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.80
 ESTIMATED PIPE DIAMETER(INCH) =  39.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      57.06
 PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   14.35
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    122.00 =    2818.51 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    124.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3040.03  DOWNSTREAM(FEET) =  2998.17
 FLOW LENGTH(FEET) =   157.30   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  36.71
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =      57.06
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   14.42
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    124.00 =    2975.81 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    124.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.790
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3539
  SUBAREA AREA(ACRES) =    0.58   SUBAREA RUNOFF(CFS) =    1.11
  TOTAL AREA(ACRES) =       32.6   TOTAL RUNOFF(CFS) =      57.06
  TC(MIN.) =   14.42
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    126.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2998.17  DOWNSTREAM(FEET) =  2978.56
  FLOW LENGTH(FEET) =    73.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  36.71
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      57.06
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.46
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    126.00 =    3049.51 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    126.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.782
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3544
  SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    0.65
  TOTAL AREA(ACRES) =       33.0   TOTAL RUNOFF(CFS) =      57.06
  TC(MIN.) =   14.46
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    126.00 TO NODE    128.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2978.56  DOWNSTREAM(FEET) =  2962.03
  FLOW LENGTH(FEET) =    65.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  35.88
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      57.06
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.49
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    128.00 =    3115.31 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    128.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2962.03  DOWNSTREAM(FEET) =  2961.94
  FLOW LENGTH(FEET) =    21.50   MANNING'S N =  0.012
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.62
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      57.06
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   14.53
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =    3136.81 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    199.00 TO NODE    151.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  18.20   RAIN INTENSITY(INCH/HOUR) =  4.12
  TOTAL AREA(ACRES) =    22.50   TOTAL RUNOFF(CFS) =     18.20

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc       INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       18.20    18.20       4.122       22.50
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    151.00 =    3136.81 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc       INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       57.06    14.53       4.766       32.95
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    151.00 =    3136.81 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      71.59      14.53        4.766
      2      67.55      18.20        4.122

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      71.59   Tc(MIN.) =   14.53
  TOTAL AREA(ACRES) =       55.5

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    152.00 TO NODE    153.00 IS CODE =  21
```

```
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3390.00
  DOWNSTREAM ELEVATION(FEET) =   3336.00
  ELEVATION DIFFERENCE(FEET) =     54.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.17

************************************************************************
  FLOW PROCESS FROM NODE    153.00 TO NODE    154.00 IS CODE =  53
------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3336.00  DOWNSTREAM(FEET) =   3257.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   154.00   CHANNEL SLOPE =  0.5130
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2256 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.17
  FLOW VELOCITY(FEET/SEC) =   2.66 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.96   Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE    152.00 TO NODE    154.00 =     254.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    153.00 TO NODE    154.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.476
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.15   SUBAREA RUNOFF(CFS) =    0.39
  TOTAL AREA(ACRES) =       0.2   TOTAL RUNOFF(CFS) =       0.55
  TC(MIN.) =    7.23

************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    155.00 IS CODE =  53
------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3257.00  DOWNSTREAM(FEET) =   3073.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   419.00   CHANNEL SLOPE =  0.4391
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2187 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.55
  FLOW VELOCITY(FEET/SEC) =   2.62 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.67   Tc(MIN.) =    9.90
  LONGEST FLOWPATH FROM NODE    152.00 TO NODE    155.00 =     673.00 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    154.00 TO NODE    155.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.106
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.23   SUBAREA RUNOFF(CFS) =    2.63
  TOTAL AREA(ACRES) =       1.4   TOTAL RUNOFF(CFS) =       3.08
```

```
  TC(MIN.) =    9.90

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    156.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3073.00  DOWNSTREAM(FEET) =   3065.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   157.00   CHANNEL SLOPE =  0.0478
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0478 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.08
  FLOW VELOCITY(FEET/SEC) =   1.78 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.47   Tc(MIN.) =   11.37
  LONGEST FLOWPATH FROM NODE    152.00 TO NODE    156.00 =     830.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    156.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.584
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.39   SUBAREA RUNOFF(CFS) =    4.67
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =       7.49
  TC(MIN.) =   11.37

****************************************************************************
  FLOW PROCESS FROM NODE    156.00 TO NODE    151.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3065.50  DOWNSTREAM(FEET) =   2963.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   486.00   CHANNEL SLOPE =  0.2109
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1655 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.49
  FLOW VELOCITY(FEET/SEC) =   4.45 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.82   Tc(MIN.) =   13.19
  LONGEST FLOWPATH FROM NODE    152.00 TO NODE    151.00 =    1316.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    156.00 TO NODE    151.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3544
  SUBAREA AREA(ACRES) =    3.03   SUBAREA RUNOFF(CFS) =    5.53
  TOTAL AREA(ACRES) =        6.9   TOTAL RUNOFF(CFS) =      12.34
  TC(MIN.) =   13.19

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.074
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3551
  SUBAREA AREA(ACRES) =    0.88   SUBAREA RUNOFF(CFS) =    1.61
  TOTAL AREA(ACRES) =        7.7   TOTAL RUNOFF(CFS) =      13.94
  TC(MIN.) =   13.19
```

```
*******************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =  11
-------------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
===============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       13.94    13.19       5.074        7.74
  LONGEST FLOWPATH FROM NODE    152.00 TO NODE    151.00 =    1316.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       71.59    14.53       4.766       55.45
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    151.00 =    3136.81 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      78.90      13.19        5.074
      2      84.69      14.53        4.766

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      84.69   Tc(MIN.) =   14.53
  TOTAL AREA(ACRES) =       63.2
===============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       63.2  TC(MIN.) =     14.53
  PEAK FLOW RATE(CFS)   =      84.69
===============================================================================
===============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-6-2009                                                               *
* PROPOSED FINAL HYDROLOGY                                                *
 ****************************************************************************

  FILE NAME: PR100B.DAT
  TIME/DATE OF STUDY: 08:21 11/06/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3164.50
  DOWNSTREAM ELEVATION(FEET) =   3163.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.902
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.485
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.54
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.54

****************************************************************************
  FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3163.00  DOWNSTREAM(FEET) =   3150.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   181.60   CHANNEL SLOPE =  0.0716
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.485
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.95
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.89
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.05
  Tc(MIN.) =    2.95
  SUBAREA AREA(ACRES) =     0.09       SUBAREA RUNOFF(CFS) =    0.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       1.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   3.30
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    162.00 =     281.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3150.00  DOWNSTREAM(FEET) =   3122.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   281.80   CHANNEL SLOPE =  0.0994
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.485
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.09
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.15
  Tc(MIN.) =    4.10
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    1.71
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       3.06

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   4.31
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    163.00 =     563.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    163.00 TO NODE    164.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3122.00  DOWNSTREAM(FEET) =   3066.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   574.30   CHANNEL SLOPE =  0.0975
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.420
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.99
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.92
  Tc(MIN.) =    6.01
  SUBAREA AREA(ACRES) =     0.40       SUBAREA RUNOFF(CFS) =    3.20
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       5.92

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   5.14
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    164.00 =    1137.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    164.00 TO NODE    165.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3066.00  DOWNSTREAM(FEET) =   3058.64
  CHANNEL LENGTH THRU SUBAREA(FEET) =   121.90   CHANNEL SLOPE =  0.0604
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.016   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.033
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .9500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.22
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.46
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.46
  Tc(MIN.) =    6.47
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.61
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.950
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       6.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   4.48
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    165.00 =    1259.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    165.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.033
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6168
  SUBAREA AREA(ACRES) =    1.26   SUBAREA RUNOFF(CFS) =    4.05
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =      10.31
  TC(MIN.) =    6.47

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    167.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3051.56  DOWNSTREAM(FEET) =  3050.86
  FLOW LENGTH(FEET) =    84.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.50
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.31
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    6.69
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    167.00 =    1344.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    167.00 TO NODE    167.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.863
  *USER SPECIFIED(SUBAREA):
  STREETS & ROADS (CURBS/STORM DRAINS) RUNOFF COEFFICIENT = .8300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6452
  SUBAREA AREA(ACRES) =    0.32   SUBAREA RUNOFF(CFS) =    2.09
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      12.18
  TC(MIN.) =    6.69

****************************************************************************
  FLOW PROCESS FROM NODE    166.00 TO NODE    166.00 IS CODE =  81
```

```
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.863
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5475
  SUBAREA AREA(ACRES) =    1.59   SUBAREA RUNOFF(CFS) =    5.00
  TOTAL AREA(ACRES) =        4.0   TOTAL RUNOFF(CFS) =      17.18
  TC(MIN.) =    6.69

****************************************************************************
  FLOW PROCESS FROM NODE    167.00 TO NODE    169.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3050.86  DOWNSTREAM(FEET) =  3050.23
  FLOW LENGTH(FEET) =    69.90   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.58
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.18
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    6.84
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    169.00 =    1414.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    169.00 TO NODE    169.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
==============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    169.00 TO NODE    169.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
==============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3190.00
  DOWNSTREAM ELEVATION(FEET) =   3060.00
  ELEVATION DIFFERENCE(FEET) =    130.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.849
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.573
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.14

****************************************************************************
  FLOW PROCESS FROM NODE    171.00 TO NODE    172.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3060.00  DOWNSTREAM(FEET) =   3053.37
  CHANNEL LENGTH THRU SUBAREA(FEET) =    48.10   CHANNEL SLOPE =  0.1378
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.251
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.24
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.36
```

```
  Tc(MIN.) =    6.21
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.436
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.59
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    172.00 =     148.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    172.00 TO NODE    173.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3053.37  DOWNSTREAM(FEET) =   3052.57
  CHANNEL LENGTH THRU SUBAREA(FEET) =   163.70   CHANNEL SLOPE =  0.0049
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.510
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.00
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.99
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   2.76
  Tc(MIN.) =    8.96
  SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    1.00
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.446
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.39

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    173.00 =     311.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    173.00 TO NODE    174.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3053.31  DOWNSTREAM(FEET) =  3052.90
  FLOW LENGTH(FEET) =    22.90   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.06
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.39
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    9.04
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    174.00 =     334.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    174.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.475
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4480
  SUBAREA AREA(ACRES) =    0.51   SUBAREA RUNOFF(CFS) =    1.49
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.87
  TC(MIN.) =    9.04

****************************************************************************
  FLOW PROCESS FROM NODE    174.00 TO NODE    176.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3052.90  DOWNSTREAM(FEET) =  3051.75
  FLOW LENGTH(FEET) =   133.60   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```

```
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.79
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.87
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    9.50
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    176.00 =     468.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    176.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.269
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4484
  SUBAREA AREA(ACRES) =    0.24   SUBAREA RUNOFF(CFS) =    0.68
  TOTAL AREA(ACRES) =        1.2   TOTAL RUNOFF(CFS) =       3.46
  TC(MIN.) =    9.50

****************************************************************************
  FLOW PROCESS FROM NODE    176.00 TO NODE    169.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3051.75  DOWNSTREAM(FEET) =  3050.30
  FLOW LENGTH(FEET) =    73.50   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.81
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.46
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    9.68
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    169.00 =     541.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    169.00 TO NODE    169.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.46     9.68       6.193        1.23
  LONGEST FLOWPATH FROM NODE    170.00 TO NODE    169.00 =     541.80 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       17.18     6.84       7.749        3.99
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    169.00 =    1414.20 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.62       6.84        7.749
      2      17.19       9.68        6.193

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.62   Tc(MIN.) =    6.84
  TOTAL AREA(ACRES) =        5.2

****************************************************************************
  FLOW PROCESS FROM NODE    169.00 TO NODE    169.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    169.00 TO NODE    178.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3051.75  DOWNSTREAM(FEET) =  3048.57
  FLOW LENGTH(FEET) =   136.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  11.20
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.62
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    7.04
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    178.00 =    1550.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    178.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.605
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .6800
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5424
  SUBAREA AREA(ACRES) =    0.69   SUBAREA RUNOFF(CFS) =    3.57
  TOTAL AREA(ACRES) =        5.9   TOTAL RUNOFF(CFS) =      24.37
  TC(MIN.) =    7.04

****************************************************************************
  FLOW PROCESS FROM NODE    178.00 TO NODE    179.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.57  DOWNSTREAM(FEET) =  3047.34
  FLOW LENGTH(FEET) =   153.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.85
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.37
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    7.37
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    179.00 =    1703.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    179.00 TO NODE    179.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.386
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5393
  SUBAREA AREA(ACRES) =    0.61   SUBAREA RUNOFF(CFS) =    2.30
  TOTAL AREA(ACRES) =        6.5   TOTAL RUNOFF(CFS) =      25.97
  TC(MIN.) =    7.37

****************************************************************************
  FLOW PROCESS FROM NODE    179.50 TO NODE    179.50 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.386
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5231
  SUBAREA AREA(ACRES) =    0.86   SUBAREA RUNOFF(CFS) =    2.54
  TOTAL AREA(ACRES) =        7.4   TOTAL RUNOFF(CFS) =      28.51
  TC(MIN.) =    7.37

****************************************************************************
  FLOW PROCESS FROM NODE    179.00 TO NODE    180.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3047.34  DOWNSTREAM(FEET) =  3045.98
  FLOW LENGTH(FEET) =   250.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.99
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.51
  PIPE TRAVEL TIME(MIN.) =   0.60    Tc(MIN.) =    7.97
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    180.00 =    1954.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.023
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .6100
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5297
  SUBAREA AREA(ACRES) =    0.61   SUBAREA RUNOFF(CFS) =    2.61
  TOTAL AREA(ACRES) =        8.0   TOTAL RUNOFF(CFS) =      29.72
  TC(MIN.) =    7.97

****************************************************************************
  FLOW PROCESS FROM NODE    180.50 TO NODE    180.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.023
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5275
  SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    3.58
  TOTAL AREA(ACRES) =        9.0   TOTAL RUNOFF(CFS) =      33.31
  TC(MIN.) =    7.97

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    181.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3045.98  DOWNSTREAM(FEET) =  3044.66
  FLOW LENGTH(FEET) =   209.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.84
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      33.31
  PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    8.41
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    181.00 =    2163.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    181.00 TO NODE    181.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.781
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5283
  SUBAREA AREA(ACRES) =    0.62   SUBAREA RUNOFF(CFS) =    2.27
  TOTAL AREA(ACRES) =        9.6   TOTAL RUNOFF(CFS) =      34.43
  TC(MIN.) =    8.41

****************************************************************************
  FLOW PROCESS FROM NODE    181.50 TO NODE    181.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.781
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5212
  SUBAREA AREA(ACRES) =    0.97   SUBAREA RUNOFF(CFS) =    2.96
  TOTAL AREA(ACRES) =       10.6   TOTAL RUNOFF(CFS) =      37.39
  TC(MIN.) =    8.41

****************************************************************************
  FLOW PROCESS FROM NODE    181.00 TO NODE    182.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3044.66  DOWNSTREAM(FEET) =  3043.58
  FLOW LENGTH(FEET) =   161.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.19
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      37.39
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    8.74
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    182.00 =    2324.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    182.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.616
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .6000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5235
  SUBAREA AREA(ACRES) =    0.33   SUBAREA RUNOFF(CFS) =    1.31
  TOTAL AREA(ACRES) =       10.9   TOTAL RUNOFF(CFS) =      37.79
  TC(MIN.) =    8.74

****************************************************************************
  FLOW PROCESS FROM NODE    182.00 TO NODE    183.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3043.58  DOWNSTREAM(FEET) =  3042.32
  FLOW LENGTH(FEET) =   197.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.04
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      37.79
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    9.15
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    183.00 =    2521.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    183.50 TO NODE    183.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.424
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5249
  SUBAREA AREA(ACRES) =    0.57   SUBAREA RUNOFF(CFS) =    2.01
  TOTAL AREA(ACRES) =       11.5   TOTAL RUNOFF(CFS) =      38.71
  TC(MIN.) =    9.15

****************************************************************************
  FLOW PROCESS FROM NODE    183.00 TO NODE    184.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3042.32  DOWNSTREAM(FEET) =  3041.22
  FLOW LENGTH(FEET) =   222.50   MANNING'S N =  0.012
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  25.0 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.40
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.71
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =    9.65
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    184.00 =    2744.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    185.00 TO NODE    186.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    186.00 TO NODE    187.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.64
  CHANNEL LENGTH THRU SUBAREA(FEET) =    42.20   CHANNEL SLOPE =  0.0014
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.815
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.44
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   1.61
  Tc(MIN.) =   10.68
  SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.31
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   0.45
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    187.00 =     142.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    187.00 TO NODE    188.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.64  DOWNSTREAM(FEET) =   3056.22
  CHANNEL LENGTH THRU SUBAREA(FEET) =     6.00   CHANNEL SLOPE =  0.0700
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
```

```
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.801
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.61
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.50
 AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   0.04
 Tc(MIN.) =   10.72
 SUBAREA AREA(ACRES) =     0.77       SUBAREA RUNOFF(CFS) =    2.01
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
 TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       2.61

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   2.91
 LONGEST FLOWPATH FROM NODE    185.00 TO NODE    188.00 =     148.20 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    188.00 TO NODE    189.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3049.72  DOWNSTREAM(FEET) =  3048.60
 FLOW LENGTH(FEET) =   162.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.31
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.61
 PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =   11.34
 LONGEST FLOWPATH FROM NODE    185.00 TO NODE    189.00 =     310.20 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    189.00 TO NODE    189.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.592
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .7600
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.5613
 SUBAREA AREA(ACRES) =    0.56   SUBAREA RUNOFF(CFS) =    2.38
 TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       4.90
 TC(MIN.) =   11.34

****************************************************************************
 FLOW PROCESS FROM NODE    189.00 TO NODE    190.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3048.60  DOWNSTREAM(FEET) =  3047.22
 FLOW LENGTH(FEET) =   222.50   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.87
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.90
 PIPE TRAVEL TIME(MIN.) =   0.76    Tc(MIN.) =   12.10
 LONGEST FLOWPATH FROM NODE    185.00 TO NODE    190.00 =     532.70 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    190.00 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.363
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .6000
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.5749
 SUBAREA AREA(ACRES) =    0.85   SUBAREA RUNOFF(CFS) =    2.74
```

```
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =       7.43
  TC(MIN.) =   12.10

****************************************************************************
  FLOW PROCESS FROM NODE    190.50 TO NODE    190.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.363
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5441
  SUBAREA AREA(ACRES) =    0.79   SUBAREA RUNOFF(CFS) =    1.91
  TOTAL AREA(ACRES) =        3.2   TOTAL RUNOFF(CFS) =       9.34
  TC(MIN.) =   12.10

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    191.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3047.22  DOWNSTREAM(FEET) =  3046.13
  FLOW LENGTH(FEET) =   162.30   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.86
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.34
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =   12.57
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    191.00 =     695.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    191.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.235
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5268
  SUBAREA AREA(ACRES) =    1.51   SUBAREA RUNOFF(CFS) =    3.87
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      12.99
  TC(MIN.) =   12.57

****************************************************************************
  FLOW PROCESS FROM NODE    191.00 TO NODE    192.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3046.13  DOWNSTREAM(FEET) =  3044.57
  FLOW LENGTH(FEET) =   215.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.37
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.99
  PIPE TRAVEL TIME(MIN.) =   0.56    Tc(MIN.) =   13.13
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    192.00 =     910.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    192.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.089
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5200
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5251
  SUBAREA AREA(ACRES) =    1.51   SUBAREA RUNOFF(CFS) =    4.00
  TOTAL AREA(ACRES) =        6.2   TOTAL RUNOFF(CFS) =      16.62
  TC(MIN.) =   13.13
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    192.00 TO NODE    193.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3044.57  DOWNSTREAM(FEET) =  3042.53
  FLOW LENGTH(FEET) =   211.30   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.75
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.62
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =   13.58
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    193.00 =    1122.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    193.00 TO NODE    193.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.978
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4900
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5184
  SUBAREA AREA(ACRES) =    1.46   SUBAREA RUNOFF(CFS) =    3.56
  TOTAL AREA(ACRES) =        7.7   TOTAL RUNOFF(CFS) =      19.82
  TC(MIN.) =   13.58

****************************************************************************
  FLOW PROCESS FROM NODE    193.00 TO NODE    184.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3042.53  DOWNSTREAM(FEET) =  3040.92
  FLOW LENGTH(FEET) =   158.10   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.17
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.82
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =   13.91
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    184.00 =    1280.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       19.82    13.91       4.903        7.68
  LONGEST FLOWPATH FROM NODE    185.00 TO NODE    184.00 =    1280.10 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)   (ACRE)
      1       38.71     9.65       6.207       11.48
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    184.00 =    2744.20 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      52.46       9.65        6.207
      2      50.40      13.91        4.903

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      52.46   Tc(MIN.) =    9.65
  TOTAL AREA(ACRES) =       19.2

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

```
 FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  13
----------------------------------------------------------------------------
 >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    194.00 TO NODE    195.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5300
 S.C.S. CURVE NUMBER (AMC II) =  88
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    66.80
 UPSTREAM ELEVATION(FEET) =   3057.70
 DOWNSTREAM ELEVATION(FEET) =   3056.90
 ELEVATION DIFFERENCE(FEET) =      0.80
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.606
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    61.98
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.237
 SUBAREA RUNOFF(CFS) =      0.58
 TOTAL AREA(ACRES) =      0.15   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
 FLOW PROCESS FROM NODE    195.00 TO NODE    196.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3056.90  DOWNSTREAM(FEET) =   3056.26
 CHANNEL LENGTH THRU SUBAREA(FEET) =    53.00   CHANNEL SLOPE =  0.0121
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.792
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5300
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.99
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.12
 AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   0.79
 Tc(MIN.) =    8.39
 SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.83
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.530
 TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.37

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   1.25
 LONGEST FLOWPATH FROM NODE    194.00 TO NODE    196.00 =     119.80 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    196.00 TO NODE    197.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3056.26  DOWNSTREAM(FEET) =   3056.14
 CHANNEL LENGTH THRU SUBAREA(FEET) =     6.00   CHANNEL SLOPE =  0.0200
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.761
*USER SPECIFIED(SUBAREA):
GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.99
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.67
AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   0.06
Tc(MIN.) =    8.45
SUBAREA AREA(ACRES) =     0.36       SUBAREA RUNOFF(CFS) =    1.24
AREA-AVERAGE RUNOFF COEFFICIENT =  0.520
TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       2.60

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.81
LONGEST FLOWPATH FROM NODE    194.00 TO NODE    197.00 =     125.80 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    197.00 TO NODE    198.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  3051.64  DOWNSTREAM(FEET) =  3050.19
FLOW LENGTH(FEET) =    41.50   MANNING'S N =  0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   7.70
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       2.60
PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    8.54
LONGEST FLOWPATH FROM NODE    194.00 TO NODE    198.00 =     167.30 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    198.00 TO NODE    199.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  3050.19  DOWNSTREAM(FEET) =  3048.58
FLOW LENGTH(FEET) =   264.80   MANNING'S N =  0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.11
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       2.60
PIPE TRAVEL TIME(MIN.) =   1.07    Tc(MIN.) =    9.61
LONGEST FLOWPATH FROM NODE    194.00 TO NODE    199.00 =     432.10 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    199.10 TO NODE    199.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.221
*USER SPECIFIED(SUBAREA):
GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .6100
S.C.S. CURVE NUMBER (AMC II) =  88
AREA-AVERAGE RUNOFF COEFFICIENT = 0.5685
SUBAREA AREA(ACRES) =    0.86   SUBAREA RUNOFF(CFS) =    3.26
TOTAL AREA(ACRES) =        1.6   TOTAL RUNOFF(CFS) =       5.66
TC(MIN.) =    9.61

****************************************************************************
FLOW PROCESS FROM NODE    199.00 TO NODE    184.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  3048.58  DOWNSTREAM(FEET) =  3048.39
FLOW LENGTH(FEET) =    42.20   MANNING'S N =  0.012
DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   4.43
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       5.66
```

```
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    9.77
  LONGEST FLOWPATH FROM NODE    194.00 TO NODE    184.00 =     474.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        5.66     9.77       6.156        1.60
  LONGEST FLOWPATH FROM NODE    194.00 TO NODE    184.00 =     474.30 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       52.46     9.65       6.207       19.16
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    184.00 =    2744.20 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      58.05       9.65        6.207
      2      57.69       9.77        6.156

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      58.05   Tc(MIN.) =    9.65
  TOTAL AREA(ACRES) =       20.8

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    184.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    184.00 TO NODE    199.20 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3040.92  DOWNSTREAM(FEET) =  3040.87
  FLOW LENGTH(FEET) =    18.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  33.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.52
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      58.05
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    9.70
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    199.20 =    2762.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    199.20 TO NODE    199.30 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3034.55  DOWNSTREAM(FEET) =  3011.11
  FLOW LENGTH(FEET) =   112.90   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  33.32
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      58.05
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    9.75
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    199.30 =    2875.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    199.30 TO NODE    199.40 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3011.11  DOWNSTREAM(FEET) =  3011.00
```

```
  FLOW LENGTH(FEET) =    24.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  42.0 INCH PIPE IS  30.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.83
  ESTIMATED PIPE DIAMETER(INCH) =  42.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      58.05
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    9.80
  LONGEST FLOWPATH FROM NODE    160.00 TO NODE    199.40 =    2899.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    199.40 TO NODE    199.40 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.143
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5181
  SUBAREA AREA(ACRES) =    1.37   SUBAREA RUNOFF(CFS) =    3.37
  TOTAL AREA(ACRES) =       22.1   TOTAL RUNOFF(CFS) =      70.43
  TC(MIN.) =    9.80

****************************************************************************
  FLOW PROCESS FROM NODE    199.50 TO NODE    199.50 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.143
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5163
  SUBAREA AREA(ACRES) =    0.34   SUBAREA RUNOFF(CFS) =    0.84
  TOTAL AREA(ACRES) =       22.5   TOTAL RUNOFF(CFS) =      71.27
  TC(MIN.) =    9.80
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       22.5  TC(MIN.) =      9.80
  PEAK FLOW RATE(CFS)   =      71.27
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                             Analysis prepared by:

                             Nolte Associates, Inc.
                            15070 Avenue of Science
                                  Suite 100
                              San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* 07-15-2009                                                             *
* PROPOSED HYDROLOGY BASIN 200                                           *
*                                                                        *
 **************************************************************************

  FILE NAME: PR200A.DAT
  TIME/DATE OF STUDY: 14:48 07/22/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    208.00 TO NODE    210.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.433
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    65.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.298
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.31

**************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    212.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.09
  CHANNEL LENGTH THRU SUBAREA(FEET) =    61.30   CHANNEL SLOPE =  0.0099
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.804
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.80
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.27
  Tc(MIN.) =   10.71
  SUBAREA AREA(ACRES) =     0.17       SUBAREA RUNOFF(CFS) =    0.44
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   0.91
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    212.00 =     161.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    218.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.09  DOWNSTREAM(FEET) =   3056.04
  CHANNEL LENGTH THRU SUBAREA(FEET) =     5.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.781
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.26
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   0.07
  Tc(MIN.) =   10.77
  SUBAREA AREA(ACRES) =     0.77       SUBAREA RUNOFF(CFS) =    1.96
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.443
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       2.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.17   FLOW VELOCITY(FEET/SEC.) =   1.50
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    218.00 =     166.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    218.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.54  DOWNSTREAM(FEET) =  3047.87
  FLOW LENGTH(FEET) =   277.80   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.30
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.69
  PIPE TRAVEL TIME(MIN.) =   1.08    Tc(MIN.) =   11.85
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    220.00 =     444.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.436
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4414
```

```
  SUBAREA AREA(ACRES) =     0.92   SUBAREA RUNOFF(CFS) =     2.20
  TOTAL AREA(ACRES) =         2.0   TOTAL RUNOFF(CFS) =       4.73
  TC(MIN.) =   11.85

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    224.00 TO NODE    226.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    18.30
  UPSTREAM ELEVATION(FEET) =   3070.00
  DOWNSTREAM ELEVATION(FEET) =   3058.00
  ELEVATION DIFFERENCE(FEET) =     12.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.502
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.485
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    226.00 TO NODE    228.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3058.00  DOWNSTREAM(FEET) =   3057.12
  CHANNEL LENGTH THRU SUBAREA(FEET) =    80.60   CHANNEL SLOPE =  0.0109
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.75
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.485
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   0.66
  Tc(MIN.) =    3.16
  SUBAREA AREA(ACRES) =     0.09       SUBAREA RUNOFF(CFS) =    0.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.426
  TOTAL AREA(ACRES) =         0.1         PEAK FLOW RATE(CFS) =       0.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.28
  LONGEST FLOWPATH FROM NODE    224.00 TO NODE    228.00 =      98.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    228.00 TO NODE    230.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3057.12  DOWNSTREAM(FEET) =   3056.53
  CHANNEL LENGTH THRU SUBAREA(FEET) =    51.50   CHANNEL SLOPE =  0.0115
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.75
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.485
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
```

```
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.90
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.30
  Tc(MIN.) =    3.46
  SUBAREA AREA(ACRES) =     0.22       SUBAREA RUNOFF(CFS) =    0.94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.441
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       1.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   3.36
  LONGEST FLOWPATH FROM NODE    224.00 TO NODE    230.00 =     150.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    220.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.85  DOWNSTREAM(FEET) =  3048.88
  FLOW LENGTH(FEET) =   198.70   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.39
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.50
  PIPE TRAVEL TIME(MIN.) =   0.98    Tc(MIN.) =    4.43
  LONGEST FLOWPATH FROM NODE    224.00 TO NODE    220.00 =     349.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         1.50     4.43       9.485        0.36
  LONGEST FLOWPATH FROM NODE    224.00 TO NODE    220.00 =     349.10 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         4.73    11.85       5.436        1.97
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    220.00 =     444.10 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       3.27       4.43        9.485
      2       5.59      11.85        5.436

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.59   Tc(MIN.) =   11.85
  TOTAL AREA(ACRES) =        2.3

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    232.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3047.87  DOWNSTREAM(FEET) =  3043.45
  FLOW LENGTH(FEET) =    14.90   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
```

```
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.37
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.59
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   11.86
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    232.00 =     459.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    234.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3043.45  DOWNSTREAM(FEET) =  3043.00
  FLOW LENGTH(FEET) =    81.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.00
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.59
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   12.13
  LONGEST FLOWPATH FROM NODE    208.00 TO NODE    234.00 =     540.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    234.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.354
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4425
  SUBAREA AREA(ACRES) =    0.36   SUBAREA RUNOFF(CFS) =    0.87
  TOTAL AREA(ACRES) =        2.7   TOTAL RUNOFF(CFS) =       6.37
  TC(MIN.) =   12.13
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.7  TC(MIN.) =     12.13
  PEAK FLOW RATE(CFS)   =       6.37
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-11-2009                                                              *
* FINAL HYDROLOGY: BASIN 200 OUTFALL                                      *
 **************************************************************************

  FILE NAME: PR200B.DAT
  TIME/DATE OF STUDY: 11:50 11/11/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3277.00
  DOWNSTREAM ELEVATION(FEET) =   3262.00
  ELEVATION DIFFERENCE(FEET) =     15.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.25   TOTAL RUNOFF(CFS) =      0.72

**************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3262.00  DOWNSTREAM(FEET) =   3207.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   148.00   CHANNEL SLOPE =  0.3716
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2090 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.72
  FLOW VELOCITY(FEET/SEC) =   2.56 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.96   Tc(MIN.) =    7.23
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     248.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.477
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.63   SUBAREA RUNOFF(CFS) =    1.65
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.30
  TC(MIN.) =    7.23

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3207.00  DOWNSTREAM(FEET) =   3170.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   215.00   CHANNEL SLOPE =  0.1721
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1460 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.30
  FLOW VELOCITY(FEET/SEC) =   2.83 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    8.50
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     463.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.737
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.42   SUBAREA RUNOFF(CFS) =    3.35
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       5.42
  TC(MIN.) =    8.50

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3170.00  DOWNSTREAM(FEET) =   3132.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   208.00   CHANNEL SLOPE =  0.1827
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       5.42
  FLOW VELOCITY(FEET/SEC) =   6.80 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.51   Tc(MIN.) =    9.01
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     671.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.488
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
```

```
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.36   SUBAREA RUNOFF(CFS) =    5.36
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      10.58
  TC(MIN.) =    9.01

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3132.00  DOWNSTREAM(FEET) =   3050.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   335.00   CHANNEL SLOPE =  0.2448
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      10.58
  FLOW VELOCITY(FEET/SEC) =   8.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.70   Tc(MIN.) =    9.70
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =    1006.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.184
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   10.68   SUBAREA RUNOFF(CFS) =   23.12
  TOTAL AREA(ACRES) =       15.3   TOTAL RUNOFF(CFS) =      33.20
  TC(MIN.) =    9.70

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3050.00  DOWNSTREAM(FEET) =   3002.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   431.00   CHANNEL SLOPE =  0.1114
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      33.20
  FLOW VELOCITY(FEET/SEC) =  10.89 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.66   Tc(MIN.) =   10.36
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =    1437.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.927
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   26.24   SUBAREA RUNOFF(CFS) =   54.44
  TOTAL AREA(ACRES) =       41.6   TOTAL RUNOFF(CFS) =      86.26
  TC(MIN.) =   10.36

****************************************************************************
  FLOW PROCESS FROM NODE    206.00 TO NODE    207.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3002.00  DOWNSTREAM(FEET) =   2952.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   430.00   CHANNEL SLOPE =  0.1163
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =      86.26
  FLOW VELOCITY(FEET/SEC) =  14.36 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.50   Tc(MIN.) =   10.86
```

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 1867.00 FEET.

****
FLOW PROCESS FROM NODE 206.00 TO NODE 207.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.750
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 88
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) = 14.23 SUBAREA RUNOFF(CFS) = 28.64
TOTAL AREA(ACRES) = 55.8 TOTAL RUNOFF(CFS) = 112.32
TC(MIN.) = 10.86

****
FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 10

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

****
FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 13

>>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
==========

****
FLOW PROCESS FROM NODE 236.00 TO NODE 236.00 IS CODE = 7

>>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==========
USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN) = 22.93 RAIN INTENSITY(INCH/HOUR) = 3.55
TOTAL AREA(ACRES) = 2.70 TOTAL RUNOFF(CFS) = 0.94

****
FLOW PROCESS FROM NODE 236.00 TO NODE 207.00 IS CODE = 53

>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
==========
ELEVATION DATA: UPSTREAM(FEET) = 3040.00 DOWNSTREAM(FEET) = 2952.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 231.00 CHANNEL SLOPE = 0.3810
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .2107 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
CHANNEL FLOW THRU SUBAREA(CFS) = 0.94
FLOW VELOCITY(FEET/SEC) = 2.57 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 1.50 Tc(MIN.) = 24.43
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 207.00 = 2098.00 FEET.

****
FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 81

>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.409
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 88
AREA-AVERAGE RUNOFF COEFFICIENT = 0.1225
SUBAREA AREA(ACRES) = 0.29 SUBAREA RUNOFF(CFS) = 0.35
TOTAL AREA(ACRES) = 3.0 TOTAL RUNOFF(CFS) = 1.25
TC(MIN.) = 24.43

****
FLOW PROCESS FROM NODE 207.00 TO NODE 207.00 IS CODE = 11

>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
==========

** MAIN STREAM CONFLUENCE DATA **

```
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         1.25    24.43        3.409        2.99
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =    2098.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       112.32    10.86        5.750       55.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    207.00 =    1867.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     112.88      10.86        5.750
      2      67.85      24.43        3.409

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     112.88   Tc(MIN.) =   10.86
  TOTAL AREA(ACRES) =       58.8

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    250.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2952.00  DOWNSTREAM(FEET) =   2540.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1318.00   CHANNEL SLOPE =  0.3126
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =     112.88
  FLOW VELOCITY(FEET/SEC) =  15.57 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.41   Tc(MIN.) =   12.27
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    250.00 =    3416.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    207.00 TO NODE    250.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.315
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3425
  SUBAREA AREA(ACRES) =   32.20   SUBAREA RUNOFF(CFS) =   59.90
  TOTAL AREA(ACRES) =       91.0   TOTAL RUNOFF(CFS) =     165.66
  TC(MIN.) =   12.27
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       91.0  TC(MIN.) =     12.27
  PEAK FLOW RATE(CFS)   =     165.66
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
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              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-24-2009                                                              *
* FINAL HYDROLOGY: BASIN 300 OUTFALL                                      *
 **************************************************************************

  FILE NAME: PR300A.DAT
  TIME/DATE OF STUDY: 09:56 11/24/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   11.0      5.5    0.020/0.020/0.020   0.08    0.10 0.0100 0.010 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    380.00 IS CODE =   7
--------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
==========================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  20.52   RAIN INTENSITY(INCH/HOUR) =  3.82
  TOTAL AREA(ACRES) =    30.00   TOTAL RUNOFF(CFS) =     47.66

**************************************************************************
  FLOW PROCESS FROM NODE    380.00 TO NODE    382.00 IS CODE =  41
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2953.23  DOWNSTREAM(FEET) =  2915.05
  FLOW LENGTH(FEET) =   121.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  36.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  36.32
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      47.66
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   20.58
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE    382.00 =     121.00 FEET.

**************************************************************************
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 FLOW PROCESS FROM NODE    382.00 TO NODE    382.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.809
 *USER SPECIFIED(SUBAREA):
 URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4162
 SUBAREA AREA(ACRES) =    0.44   SUBAREA RUNOFF(CFS) =    0.67
 TOTAL AREA(ACRES) =       30.4   TOTAL RUNOFF(CFS) =      48.25
 TC(MIN.) =   20.58

****************************************************************************
 FLOW PROCESS FROM NODE    382.00 TO NODE    386.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  2915.05  DOWNSTREAM(FEET) =  2889.67
 FLOW LENGTH(FEET) =    91.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  36.0 INCH PIPE IS   9.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  34.88
 GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      48.25
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   20.62
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    386.00 =     212.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    386.00 TO NODE    386.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.803
 *USER SPECIFIED(SUBAREA):
 URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4158
 SUBAREA AREA(ACRES) =    0.70   SUBAREA RUNOFF(CFS) =    1.06
 TOTAL AREA(ACRES) =       31.1   TOTAL RUNOFF(CFS) =      49.25
 TC(MIN.) =   20.62

****************************************************************************
 FLOW PROCESS FROM NODE    386.00 TO NODE    392.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   2887.90  DOWNSTREAM(FEET) =   2868.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =   138.00   CHANNEL SLOPE =  0.1442
 NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
 CHANNEL FLOW THRU SUBAREA(CFS) =      49.25
 FLOW VELOCITY(FEET/SEC) =  12.19 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.19   Tc(MIN.) =   20.81
 LONGEST FLOWPATH FROM NODE      0.00 TO NODE    392.00 =     350.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    392.00 TO NODE    392.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.781
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.3990
 SUBAREA AREA(ACRES) =   10.69   SUBAREA RUNOFF(CFS) =   14.15
 TOTAL AREA(ACRES) =       41.8   TOTAL RUNOFF(CFS) =      63.11
 TC(MIN.) =   20.81
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       41.8  TC(MIN.) =     20.81
 PEAK FLOW RATE(CFS)   =      63.11
============================================================================
```

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END OF RATIONAL METHOD ANALYSIS

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**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                             Analysis prepared by:

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                            15070 Avenue of Science
                                  Suite 100
                              San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-6-2009                                                               *
* FINAL HYDROLOGY                                                         *
 **************************************************************************

  FILE NAME: PR300B.DAT
  TIME/DATE OF STUDY: 10:25 11/06/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   11.0      5.5    0.020/0.020/0.020   0.08    0.10 0.0100 0.010 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  94
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3190.00
  DOWNSTREAM ELEVATION(FEET) =   3060.00
  ELEVATION DIFFERENCE(FEET) =    130.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.849
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.573
  SUBAREA RUNOFF(CFS) =      0.14
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.14

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3060.00  DOWNSTREAM(FEET) =   3053.40
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    53.00   CHANNEL SLOPE =  0.1245
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.228
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4300
  S.C.S. CURVE NUMBER (AMC II) =  94
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.30
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.38
  Tc(MIN.) =    6.23
  SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.422
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.59
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     153.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3053.40  DOWNSTREAM(FEET) =   3052.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   195.10   CHANNEL SLOPE =  0.0051
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =  10.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.280
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4100
  S.C.S. CURVE NUMBER (AMC II) =  94
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.00
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   3.24
  Tc(MIN.) =    9.48
  SUBAREA AREA(ACRES) =     0.38       SUBAREA RUNOFF(CFS) =    0.98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.413
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       1.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   1.08
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     348.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3052.40  DOWNSTREAM(FEET) =  3050.81
  FLOW LENGTH(FEET) =    68.80   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.38
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =    9.68
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     416.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.192
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  94
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4353
  SUBAREA AREA(ACRES) =    0.79   SUBAREA RUNOFF(CFS) =    2.20
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       3.56
  TC(MIN.) =    9.68
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    305.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3050.81  DOWNSTREAM(FEET) =  3050.65
  FLOW LENGTH(FEET) =    83.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.87
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.56
  PIPE TRAVEL TIME(MIN.) =   0.49    Tc(MIN.) =   10.17
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    305.00 =     500.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    305.20 TO NODE    305.40 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3302.00
  DOWNSTREAM ELEVATION(FEET) =   3266.00
  ELEVATION DIFFERENCE(FEET) =     36.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    305.40 TO NODE    305.60 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3266.00  DOWNSTREAM(FEET) =   3218.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   140.00   CHANNEL SLOPE =  0.3429
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2040 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.15
  FLOW VELOCITY(FEET/SEC) =   2.53 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.92   Tc(MIN.) =    7.19
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    305.60 =     240.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.40 TO NODE    305.40 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.504
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.14   SUBAREA RUNOFF(CFS) =    0.35
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.49
```

```
  TC(MIN.) =    7.19

****************************************************************************
  FLOW PROCESS FROM NODE    305.60 TO NODE    306.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3218.00  DOWNSTREAM(FEET) =   3056.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   412.00   CHANNEL SLOPE =  0.3920
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.495
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.80
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.80
  Tc(MIN.) =    8.99
  SUBAREA AREA(ACRES) =     0.83       SUBAREA RUNOFF(CFS) =    2.16
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.391
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       2.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   4.68
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    306.00 =     652.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    305.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3051.50  DOWNSTREAM(FEET) =  3050.65
  FLOW LENGTH(FEET) =    24.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   4.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.64
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.58
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    9.05
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    305.00 =     676.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        2.58     9.05       6.470        1.02
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    305.00 =     676.70 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.56    10.17       6.000        1.32
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    305.00 =     500.60 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       5.75       9.05        6.470
      2       5.95      10.17        6.000

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.95   Tc(MIN.) =   10.17
  TOTAL AREA(ACRES) =        2.3

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    305.00 IS CODE =  12
----------------------------------------------------------------------------
```

```
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
================================================================================

********************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    307.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3050.65  DOWNSTREAM(FEET) =  3049.49
  FLOW LENGTH(FEET) =   122.80   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.95
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =   10.51
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    307.00 =     799.50 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    307.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.873
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4700
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4295
  SUBAREA AREA(ACRES) =    0.78   SUBAREA RUNOFF(CFS) =    2.15
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =       7.86
  TC(MIN.) =   10.51

********************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    308.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.49  DOWNSTREAM(FEET) =  3048.21
  FLOW LENGTH(FEET) =   162.50   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.91
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.86
  PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =   10.97
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    308.00 =     962.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    308.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.714
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4600
  SUBAREA AREA(ACRES) =    0.95   SUBAREA RUNOFF(CFS) =    3.04
  TOTAL AREA(ACRES) =        4.1   TOTAL RUNOFF(CFS) =      10.69
  TC(MIN.) =   10.97

********************************************************************************
  FLOW PROCESS FROM NODE    308.50 TO NODE    308.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.714
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4729
  SUBAREA AREA(ACRES) =    0.68   SUBAREA RUNOFF(CFS) =    2.14
  TOTAL AREA(ACRES) =        4.7   TOTAL RUNOFF(CFS) =      12.83
```

```
  TC(MIN.) =   10.97

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    309.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.21  DOWNSTREAM(FEET) =  3045.78
  FLOW LENGTH(FEET) =   290.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.83
  PIPE TRAVEL TIME(MIN.) =   0.71    Tc(MIN.) =   11.68
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    309.00 =    1252.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.487
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4847
  SUBAREA AREA(ACRES) =    1.24   SUBAREA RUNOFF(CFS) =    3.61
  TOTAL AREA(ACRES) =        6.0   TOTAL RUNOFF(CFS) =      15.92
  TC(MIN.) =   11.68

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    44.00   CHANNEL SLOPE =  0.0114
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.121
*USER SPECIFIED(SUBAREA):
GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.49
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.92
AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.80
Tc(MIN.) =    9.86
SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.33
AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.63

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   0.99
LONGEST FLOWPATH FROM NODE    310.00 TO NODE    312.00 =     144.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    312.00 TO NODE    313.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   3056.20  DOWNSTREAM(FEET) =   3055.93
CHANNEL LENGTH THRU SUBAREA(FEET) =    11.40   CHANNEL SLOPE =  0.0237
CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.080
*USER SPECIFIED(SUBAREA):
GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.83
AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   0.10
Tc(MIN.) =    9.96
SUBAREA AREA(ACRES) =     1.00       SUBAREA RUNOFF(CFS) =    3.10
AREA-AVERAGE RUNOFF COEFFICIENT =  0.499
TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       3.73

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   2.11
LONGEST FLOWPATH FROM NODE    310.00 TO NODE    313.00 =     155.40 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    313.00 TO NODE    309.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  3049.43  DOWNSTREAM(FEET) =  3046.47
FLOW LENGTH(FEET) =   216.20   MANNING'S N =  0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.09
ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =       3.73
PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =   10.56
LONGEST FLOWPATH FROM NODE    310.00 TO NODE    309.00 =     371.60 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 IS CODE =  11
----------------------------------------------------------------------------
>>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

** MAIN STREAM CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1        3.73    10.56       5.858        1.23
LONGEST FLOWPATH FROM NODE    310.00 TO NODE    309.00 =     371.60 FEET.

** MEMORY BANK #  1 CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY     AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
    1       15.92    11.68       5.487        5.99
```

```
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    309.00 =    1252.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      18.12      10.56        5.858
      2      19.42      11.68        5.487

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      19.42   Tc(MIN.) =   11.68
  TOTAL AREA(ACRES) =        7.2

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    309.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    314.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3045.78  DOWNSTREAM(FEET) =  3044.19
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.76
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.42
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =   12.32
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    314.00 =    1512.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.301
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4948
  SUBAREA AREA(ACRES) =    1.23   SUBAREA RUNOFF(CFS) =    3.52
  TOTAL AREA(ACRES) =        8.4   TOTAL RUNOFF(CFS) =      22.16
  TC(MIN.) =   12.32

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    315.00 TO NODE    316.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.32
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    316.00 TO NODE    317.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    45.69   CHANNEL SLOPE =  0.0109
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.012   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.273
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.50
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.77
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.43
  Tc(MIN.) =    9.49
  SUBAREA AREA(ACRES) =     0.13       SUBAREA RUNOFF(CFS) =    0.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.68

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   1.87
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    317.00 =     145.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    317.00 TO NODE    318.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.20  DOWNSTREAM(FEET) =   3056.06
  CHANNEL LENGTH THRU SUBAREA(FEET) =    17.80   CHANNEL SLOPE =  0.0079
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.170
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.04
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.20
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   0.25
  Tc(MIN.) =    9.74
  SUBAREA AREA(ACRES) =     0.98       SUBAREA RUNOFF(CFS) =    2.72
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       3.39

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   1.36
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    318.00 =     163.49 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    318.00 TO NODE    319.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.50  DOWNSTREAM(FEET) =  3048.10
  FLOW LENGTH(FEET) =   216.30   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.51
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        3.39
  PIPE TRAVEL TIME(MIN.) =   0.80    Tc(MIN.) =   10.54
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    319.00 =     379.79 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    319.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.864
```

```
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    1.22   SUBAREA RUNOFF(CFS) =    3.22
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =       6.44
  TC(MIN.) =   10.54

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    319.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.864
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    1.17   SUBAREA RUNOFF(CFS) =    3.09
  TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       9.53
  TC(MIN.) =   10.54

****************************************************************************
  FLOW PROCESS FROM NODE    319.00 TO NODE    314.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.10  DOWNSTREAM(FEET) =  3044.19
  FLOW LENGTH(FEET) =   268.70   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.87
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.53
  PIPE TRAVEL TIME(MIN.) =   0.57    Tc(MIN.) =   11.11
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    314.00 =     648.49 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         9.53    11.11       5.668        3.61
  LONGEST FLOWPATH FROM NODE    315.00 TO NODE    314.00 =     648.49 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        22.16    12.32       5.301        8.45
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    314.00 =    1512.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      29.50      11.11       5.668
      2      31.07      12.32       5.301

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      31.07   Tc(MIN.) =   12.32
  TOTAL AREA(ACRES) =       12.1

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  10
----------------------------------------------------------------------------
```

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

********************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  13
--------------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
================================================================================

********************************************************************************
  FLOW PROCESS FROM NODE    322.00 TO NODE    323.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.32

********************************************************************************
  FLOW PROCESS FROM NODE    323.00 TO NODE    324.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =    44.00   CHANNEL SLOPE =  0.0114
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.121
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.92
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   0.80
  Tc(MIN.) =    9.86
  SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.63

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   0.99
  LONGEST FLOWPATH FROM NODE    322.00 TO NODE    324.00 =     144.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    325.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.20  DOWNSTREAM(FEET) =   3055.92
  CHANNEL LENGTH THRU SUBAREA(FEET) =    11.70   CHANNEL SLOPE =  0.0239
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.079
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.18
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.83
  AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   0.11
  Tc(MIN.) =    9.97
```

```
  SUBAREA AREA(ACRES) =     1.00       SUBAREA RUNOFF(CFS) =    3.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.499
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       3.73

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   2.11
  LONGEST FLOWPATH FROM NODE    322.00 TO NODE    325.00 =     155.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    325.00 TO NODE    314.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.42  DOWNSTREAM(FEET) =  3044.19
  FLOW LENGTH(FEET) =   215.70   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.49
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.73
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =   10.45
  LONGEST FLOWPATH FROM NODE    322.00 TO NODE    314.00 =     371.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.73    10.45       5.897        1.23
  LONGEST FLOWPATH FROM NODE    322.00 TO NODE    314.00 =     371.40 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       31.07    12.32       5.301       12.06
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    314.00 =    1512.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      30.07      10.45        5.897
      2      34.42      12.32        5.301

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      34.42   Tc(MIN.) =   12.32
  TOTAL AREA(ACRES) =       13.3

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    314.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    314.00 TO NODE    326.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3044.19  DOWNSTREAM(FEET) =  3041.87
  FLOW LENGTH(FEET) =   239.50   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.23
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      34.42
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =   12.75
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    326.00 =    1751.50 FEET.

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

```
 FLOW PROCESS FROM NODE    326.00 TO NODE    326.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.185
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5700
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4878
 SUBAREA AREA(ACRES) =    0.77   SUBAREA RUNOFF(CFS) =    2.28
 TOTAL AREA(ACRES) =       14.1   TOTAL RUNOFF(CFS) =      35.55
 TC(MIN.) =   12.75

****************************************************************************
 FLOW PROCESS FROM NODE    326.00 TO NODE    326.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    326.00 TO NODE    326.00 IS CODE =  13
----------------------------------------------------------------------------
 >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    328.00 TO NODE    329.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
 *USER SPECIFIED(SUBAREA):
 URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
 S.C.S. CURVE NUMBER (AMC II) =  88
 INITIAL SUBAREA FLOW-LENGTH(FEET) =    98.00
 UPSTREAM ELEVATION(FEET) =   3134.00
 DOWNSTREAM ELEVATION(FEET) =   3088.79
 ELEVATION DIFFERENCE(FEET) =     45.21
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.790
 WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.629
 SUBAREA RUNOFF(CFS) =      0.35
 TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.35

****************************************************************************
 FLOW PROCESS FROM NODE    329.00 TO NODE    330.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3088.79  DOWNSTREAM(FEET) =    307.82
 CHANNEL LENGTH THRU SUBAREA(FEET) =   110.80   CHANNEL SLOPE = 25.0990
 CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   1.000
 MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.571
 *USER SPECIFIED(SUBAREA):
 URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.76
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  30.32
 AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   0.06
 Tc(MIN.) =    5.85
 SUBAREA AREA(ACRES) =     0.24       SUBAREA RUNOFF(CFS) =    0.82
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.400
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       1.17

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.02   FLOW VELOCITY(FEET/SEC.) =  31.88
 LONGEST FLOWPATH FROM NODE    328.00 TO NODE    330.00 =     208.80 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    330.00 TO NODE    331.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3085.02  DOWNSTREAM(FEET) =  3050.52
  FLOW LENGTH(FEET) =    59.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.37
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.17
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.91
  LONGEST FLOWPATH FROM NODE    328.00 TO NODE    331.00 =     267.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    326.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3050.52  DOWNSTREAM(FEET) =  3041.87
  FLOW LENGTH(FEET) =    21.10   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.43
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.17
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.94
  LONGEST FLOWPATH FROM NODE    328.00 TO NODE    326.00 =     288.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    326.00 TO NODE    326.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
==============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        1.17     5.94       8.492        0.34
  LONGEST FLOWPATH FROM NODE    328.00 TO NODE    326.00 =     288.90 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       35.55    12.75       5.185       14.06
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    326.00 =    1751.50 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      17.71       5.94        8.492
      2      36.26      12.75        5.185

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      36.26   Tc(MIN.) =   12.75
  TOTAL AREA(ACRES) =       14.4

****************************************************************************
  FLOW PROCESS FROM NODE    326.00 TO NODE    326.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
==============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    326.00 TO NODE    332.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3041.87  DOWNSTREAM(FEET) =  3040.79
  FLOW LENGTH(FEET) =   216.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.17
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      36.26
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   13.26
```

```
 LONGEST FLOWPATH FROM NODE    305.20 TO NODE    332.00 =    1967.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    332.00 TO NODE    332.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.057
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4869
 SUBAREA AREA(ACRES) =    0.78   SUBAREA RUNOFF(CFS) =    2.01
 TOTAL AREA(ACRES) =       15.2   TOTAL RUNOFF(CFS) =      37.37
 TC(MIN.) =   13.26

****************************************************************************
 FLOW PROCESS FROM NODE    332.00 TO NODE    333.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3040.79  DOWNSTREAM(FEET) =  3040.43
 FLOW LENGTH(FEET) =    75.80   MANNING'S N =  0.012
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.24
 ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      37.37
 PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =   13.43
 LONGEST FLOWPATH FROM NODE    305.20 TO NODE    333.00 =    2043.30 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    333.00 TO NODE    335.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3040.43  DOWNSTREAM(FEET) =  3039.83
 FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  24.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.39
 ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      37.37
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   13.70
 LONGEST FLOWPATH FROM NODE    305.20 TO NODE    335.00 =    2163.30 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    335.00 TO NODE    335.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.950
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5400
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4888
 SUBAREA AREA(ACRES) =    0.55   SUBAREA RUNOFF(CFS) =    1.47
 TOTAL AREA(ACRES) =       15.7   TOTAL RUNOFF(CFS) =      38.06
 TC(MIN.) =   13.70

****************************************************************************
 FLOW PROCESS FROM NODE    335.00 TO NODE    336.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3039.83  DOWNSTREAM(FEET) =  3038.68
 FLOW LENGTH(FEET) =   174.10   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.16
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      38.06
 PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =   14.06
 LONGEST FLOWPATH FROM NODE    305.20 TO NODE    336.00 =    2337.40 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    336.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.869
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4905
  SUBAREA AREA(ACRES) =    0.46   SUBAREA RUNOFF(CFS) =    1.23
  TOTAL AREA(ACRES) =       16.2   TOTAL RUNOFF(CFS) =      38.66
  TC(MIN.) =   14.06

****************************************************************************
  FLOW PROCESS FROM NODE    336.00 TO NODE    337.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3038.68  DOWNSTREAM(FEET) =  3037.72
  FLOW LENGTH(FEET) =   136.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.42
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.66
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   14.33
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    337.00 =    2473.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    337.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.810
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4915
  SUBAREA AREA(ACRES) =    0.33   SUBAREA RUNOFF(CFS) =    0.86
  TOTAL AREA(ACRES) =       16.5   TOTAL RUNOFF(CFS) =      39.05
  TC(MIN.) =   14.33

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    337.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    337.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    345.00 TO NODE    346.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
```

```
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    346.00 TO NODE    347.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    68.60   CHANNEL SLOPE =  0.0102
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.958
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.94
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   1.22
  Tc(MIN.) =   10.28
  SUBAREA AREA(ACRES) =     0.21       SUBAREA RUNOFF(CFS) =    0.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.86

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   1.03
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    347.00 =     168.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    347.00 TO NODE    348.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.00  DOWNSTREAM(FEET) =   3055.88
  CHANNEL LENGTH THRU SUBAREA(FEET) =    13.70   CHANNEL SLOPE =  0.0088
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.894
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.31
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   0.17
  Tc(MIN.) =   10.46
  SUBAREA AREA(ACRES) =     1.19       SUBAREA RUNOFF(CFS) =    3.16
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.450
  TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       4.00

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOW VELOCITY(FEET/SEC.) =   1.48
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    348.00 =     182.30 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    348.00 TO NODE    349.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.38  DOWNSTREAM(FEET) =  3048.00
  FLOW LENGTH(FEET) =   277.70   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   9.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.27
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.00
  PIPE TRAVEL TIME(MIN.) =   1.08    Tc(MIN.) =   11.54
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    349.00 =     460.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    349.00 TO NODE    349.00 IS CODE =  81
----------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.531
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    1.56   SUBAREA RUNOFF(CFS) =    3.88
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =       7.64
  TC(MIN.) =   11.54

********************************************************************************
  FLOW PROCESS FROM NODE    349.00 TO NODE    350.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.00  DOWNSTREAM(FEET) =  3046.12
  FLOW LENGTH(FEET) =   195.40   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       7.64
  PIPE TRAVEL TIME(MIN.) =   0.51    Tc(MIN.) =   12.05
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    350.00 =     655.40 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    351.00 TO NODE    350.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.378
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    0.70   SUBAREA RUNOFF(CFS) =    1.69
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =       9.12
  TC(MIN.) =   12.05

********************************************************************************
  FLOW PROCESS FROM NODE    350.00 TO NODE    354.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3046.12  DOWNSTREAM(FEET) =  3044.66
  FLOW LENGTH(FEET) =   236.10   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.65
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.12
  PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =   12.75
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    354.00 =     891.50 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    355.00 TO NODE    354.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.187
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5400
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4646
  SUBAREA AREA(ACRES) =    0.73   SUBAREA RUNOFF(CFS) =    2.04
  TOTAL AREA(ACRES) =        4.5   TOTAL RUNOFF(CFS) =      10.84
  TC(MIN.) =   12.75

********************************************************************************
  FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =  10
--------------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
================================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    358.00 TO NODE    359.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    359.00 TO NODE    360.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    65.70   CHANNEL SLOPE =  0.0107
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.991
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.97
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   1.13
  Tc(MIN.) =   10.19
  SUBAREA AREA(ACRES) =     0.18       SUBAREA RUNOFF(CFS) =    0.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.489
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   1.07
  LONGEST FLOWPATH FROM NODE    358.00 TO NODE    360.00 =     165.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    360.00 TO NODE    361.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3056.00  DOWNSTREAM(FEET) =   3055.99
  CHANNEL LENGTH THRU SUBAREA(FEET) =     5.00   CHANNEL SLOPE =  0.0020
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.948
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.05
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.72
  AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   0.12
  Tc(MIN.) =   10.31
  SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    2.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.504
  TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       3.27

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   0.82
  LONGEST FLOWPATH FROM NODE    358.00 TO NODE    361.00 =     170.70 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    361.00 TO NODE    362.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3049.49  DOWNSTREAM(FEET) =  3048.33
  FLOW LENGTH(FEET) =   174.10   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.52
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.27
  PIPE TRAVEL TIME(MIN.) =   0.64    Tc(MIN.) =   10.95
  LONGEST FLOWPATH FROM NODE    358.00 TO NODE    362.00 =     344.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    362.00 TO NODE    362.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.720
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5024
  SUBAREA AREA(ACRES) =    0.98   SUBAREA RUNOFF(CFS) =    2.80
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =       5.95
  TC(MIN.) =   10.95

****************************************************************************
  FLOW PROCESS FROM NODE    362.00 TO NODE    354.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.33  DOWNSTREAM(FEET) =  3044.66
  FLOW LENGTH(FEET) =   136.10   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.85
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.95
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =   11.21
  LONGEST FLOWPATH FROM NODE    358.00 TO NODE    354.00 =     480.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         5.95    11.21       5.636        2.07
  LONGEST FLOWPATH FROM NODE    358.00 TO NODE    354.00 =     480.90 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        10.84    12.75       5.187        4.50
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    354.00 =     891.50 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      15.48      11.21        5.636
      2      16.32      12.75        5.187

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.32   Tc(MIN.) =   12.75
  TOTAL AREA(ACRES) =        6.6
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    354.00 TO NODE    354.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    354.00 TO NODE    363.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3044.66  DOWNSTREAM(FEET) =  3043.08
  FLOW LENGTH(FEET) =   260.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.37
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.32
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =   13.43
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    363.00 =    1151.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    364.00 TO NODE    363.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.016
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5800
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4868
  SUBAREA AREA(ACRES) =    0.73   SUBAREA RUNOFF(CFS) =    2.12
  TOTAL AREA(ACRES) =        7.3   TOTAL RUNOFF(CFS) =      17.83
  TC(MIN.) =   13.43

****************************************************************************
  FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    365.00 TO NODE    367.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3057.70
  DOWNSTREAM ELEVATION(FEET) =   3056.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.063
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.463
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    367.00 TO NODE    368.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   3056.70  DOWNSTREAM(FEET) =   3056.00
 CHANNEL LENGTH THRU SUBAREA(FEET) =    65.70   CHANNEL SLOPE =  0.0107
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.991
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5100
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.57
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.97
 AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   1.13
 Tc(MIN.) =   10.19
 SUBAREA AREA(ACRES) =     0.18       SUBAREA RUNOFF(CFS) =    0.55
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.489
 TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.82

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   1.07
 LONGEST FLOWPATH FROM NODE    365.00 TO NODE    368.00 =     165.70 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    368.00 TO NODE    369.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   3056.00  DOWNSTREAM(FEET) =   3055.99
 CHANNEL LENGTH THRU SUBAREA(FEET) =     5.10   CHANNEL SLOPE =  0.0020
 CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =  20.000
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   0.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.946
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5000
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.02
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.71
 AVERAGE FLOW DEPTH(FEET) =   0.31   TRAVEL TIME(MIN.) =   0.12
 Tc(MIN.) =   10.31
 SUBAREA AREA(ACRES) =     0.81       SUBAREA RUNOFF(CFS) =    2.41
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.497
 TOTAL AREA(ACRES) =        1.1         PEAK FLOW RATE(CFS) =       3.22

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   0.80
 LONGEST FLOWPATH FROM NODE    365.00 TO NODE    369.00 =     170.80 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    369.00 TO NODE    370.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  3049.49  DOWNSTREAM(FEET) =  3048.34
 FLOW LENGTH(FEET) =   174.10   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.49
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.22
 PIPE TRAVEL TIME(MIN.) =   0.65    Tc(MIN.) =   10.96
 LONGEST FLOWPATH FROM NODE    365.00 TO NODE    370.00 =     344.90 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    370.00 TO NODE    370.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.718
 *USER SPECIFIED(SUBAREA):
 GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .5000
 S.C.S. CURVE NUMBER (AMC II) =  88
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4985
 SUBAREA AREA(ACRES) =    0.98   SUBAREA RUNOFF(CFS) =    2.80
 TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =       5.90
```

```
  TC(MIN.) =   10.96

****************************************************************************
  FLOW PROCESS FROM NODE    370.00 TO NODE    363.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3048.34  DOWNSTREAM(FEET) =  3043.08
  FLOW LENGTH(FEET) =   136.00   MANNING'S N =  0.012
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  10.08
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.90
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =   11.18
  LONGEST FLOWPATH FROM NODE    365.00 TO NODE    363.00 =     480.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        5.90    11.18       5.643        2.07
  LONGEST FLOWPATH FROM NODE    365.00 TO NODE    363.00 =     480.90 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       17.83    13.43       5.016        7.30
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    363.00 =    1151.50 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      20.75      11.18        5.643
      2      23.07      13.43        5.016

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.07   Tc(MIN.) =   13.43
  TOTAL AREA(ACRES) =        9.4

****************************************************************************
  FLOW PROCESS FROM NODE    363.00 TO NODE    363.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    363.00 TO NODE    337.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3043.08  DOWNSTREAM(FEET) =  3041.20
  FLOW LENGTH(FEET) =   239.50   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.73
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      23.07
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   13.94
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    337.00 =    1391.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    337.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)    (INCH/HOUR)   (ACRE)
      1       23.07    13.94        4.895        9.37
  LONGEST FLOWPATH FROM NODE    345.00 TO NODE    337.00 =    1391.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)    (INCH/HOUR)   (ACRE)
      1       39.05    14.33        4.810       16.52
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    337.00 =    2473.40 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)    (INCH/HOUR)
      1      61.07      13.94        4.895
      2      61.72      14.33        4.810

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      61.72   Tc(MIN.) =   14.33
  TOTAL AREA(ACRES) =       25.9

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    337.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    337.00 TO NODE    371.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3037.72  DOWNSTREAM(FEET) =  3037.64
  FLOW LENGTH(FEET) =    22.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  45.0 INCH PIPE IS  32.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.29
  ESTIMATED PIPE DIAMETER(INCH) =  45.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      61.72
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =   14.38
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    371.00 =    2496.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    371.00 TO NODE    372.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3037.64  DOWNSTREAM(FEET) =  3037.25
  FLOW LENGTH(FEET) =    25.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.44
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      61.72
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.41
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    372.00 =    2522.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    372.00 TO NODE    373.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3037.25  DOWNSTREAM(FEET) =  3007.99
  FLOW LENGTH(FEET) =    77.80   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  41.46
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      61.72
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.45
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    373.00 =    2599.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    373.00 TO NODE    373.00 IS CODE =  81
```

```
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.785
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4881
  SUBAREA AREA(ACRES) =    0.78   SUBAREA RUNOFF(CFS) =    1.49
  TOTAL AREA(ACRES) =       26.7   TOTAL RUNOFF(CFS) =      62.28
  TC(MIN.) =   14.45

************************************************************************
  FLOW PROCESS FROM NODE    373.00 TO NODE    374.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  3007.99  DOWNSTREAM(FEET) =  2984.19
  FLOW LENGTH(FEET) =    67.30   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  40.25
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      62.28
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.47
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    374.00 =    2667.10 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    374.00 TO NODE    374.00 IS CODE =  81
------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.779
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4843
  SUBAREA AREA(ACRES) =    1.19   SUBAREA RUNOFF(CFS) =    2.27
  TOTAL AREA(ACRES) =       27.9   TOTAL RUNOFF(CFS) =      64.48
  TC(MIN.) =   14.47

************************************************************************
  FLOW PROCESS FROM NODE    374.00 TO NODE    376.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2984.19  DOWNSTREAM(FEET) =  2962.02
  FLOW LENGTH(FEET) =    66.40   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  41.20
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      64.48
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.50
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    376.00 =    2733.50 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    376.00 TO NODE    378.00 IS CODE =  31
------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  2962.02  DOWNSTREAM(FEET) =  2960.90
  FLOW LENGTH(FEET) =    27.90   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.52
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      64.48
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =   14.52
  LONGEST FLOWPATH FROM NODE    305.20 TO NODE    378.00 =    2761.40 FEET.

************************************************************************
  FLOW PROCESS FROM NODE    378.00 TO NODE    378.00 IS CODE =  81
------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.768
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .4000
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4783
  SUBAREA AREA(ACRES) =    2.14   SUBAREA RUNOFF(CFS) =    4.08
  TOTAL AREA(ACRES) =       30.0   TOTAL RUNOFF(CFS) =      68.41
  TC(MIN.) =   14.52
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       30.0  TC(MIN.) =     14.52
  PEAK FLOW RATE(CFS)   =      68.41
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-9-2009                                                               *
* PROPOSED HYDROLOGY                                                      *
 **************************************************************************

  FILE NAME: PR400.DAT
  TIME/DATE OF STUDY: 08:48 11/09/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 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.*

**************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   2979.00
  DOWNSTREAM ELEVATION(FEET) =   2962.00
  ELEVATION DIFFERENCE(FEET) =     17.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.26

**************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2962.00  DOWNSTREAM(FEET) =   2924.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   147.00   CHANNEL SLOPE =  0.2585
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1828 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.26
  FLOW VELOCITY(FEET/SEC) =   2.39 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.02   Tc(MIN.) =    7.29
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    402.00 =     247.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    402.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.437
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.94
  TC(MIN.) =    7.29

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2924.00  DOWNSTREAM(FEET) =   2784.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   243.00   CHANNEL SLOPE =  0.5761
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2288 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.94
  FLOW VELOCITY(FEET/SEC) =   2.68 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.51   Tc(MIN.) =    8.80
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    403.00 =     490.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    403.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.586
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.94   SUBAREA RUNOFF(CFS) =    2.17
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       3.00
  TC(MIN.) =    8.80

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2784.00  DOWNSTREAM(FEET) =   2671.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   176.00   CHANNEL SLOPE =  0.6420
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2300 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.00
  FLOW VELOCITY(FEET/SEC) =   3.87 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.76   Tc(MIN.) =    9.56
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    404.00 =     666.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    404.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.244
```

```
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.83   SUBAREA RUNOFF(CFS) =    4.00
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =       6.84
  TC(MIN.) =    9.56

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   2671.00  DOWNSTREAM(FEET) =   2510.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   520.00   CHANNEL SLOPE =  0.3096
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1974 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.84
  FLOW VELOCITY(FEET/SEC) =   4.72 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.84   Tc(MIN.) =   11.40
  LONGEST FLOWPATH FROM NODE    400.00 TO NODE    405.00 =    1186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    405.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.575
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.67   SUBAREA RUNOFF(CFS) =    5.21
  TOTAL AREA(ACRES) =        5.8   TOTAL RUNOFF(CFS) =      11.32
  TC(MIN.) =   11.40
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        5.8  TC(MIN.) =     11.40
  PEAK FLOW RATE(CFS)   =      11.32
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                   Suite 100
                               San Diego, CA 92128

 *************************** DESCRIPTION OF STUDY ***************************
* SDB039600                                                                 *
* 05-21-2009                                                                *
* BASIN 500                                                                 *
 **************************************************************************

  FILE NAME: PR500.DAT
  TIME/DATE OF STUDY: 08:50 05/21/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    500.00 TO NODE    505.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3256.00
  DOWNSTREAM ELEVATION(FEET) =   3248.20
  ELEVATION DIFFERENCE(FEET) =      7.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.808
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.773
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.52

**************************************************************************
  FLOW PROCESS FROM NODE    505.00 TO NODE    510.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3248.20  DOWNSTREAM(FEET) =   3244.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    87.00   CHANNEL SLOPE =  0.0483
```

```
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0483 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.52
  FLOW VELOCITY(FEET/SEC) =   1.23 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.18   Tc(MIN.) =    7.99
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    510.00 =     187.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    505.00 TO NODE    510.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.012
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.70   SUBAREA RUNOFF(CFS) =    1.72
  TOTAL AREA(ACRES) =        0.9   TOTAL RUNOFF(CFS) =       2.18
  TC(MIN.) =    7.99

****************************************************************************
  FLOW PROCESS FROM NODE    510.00 TO NODE    515.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3244.00  DOWNSTREAM(FEET) =   3236.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   154.00   CHANNEL SLOPE =  0.0519
  CHANNEL BASE(FEET) =   40.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.050
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.25
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   2.05
  Tc(MIN.) =   10.04
  SUBAREA AREA(ACRES) =     1.84       SUBAREA RUNOFF(CFS) =    3.90
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        2.7         PEAK FLOW RATE(CFS) =       5.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.47
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    515.00 =     341.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    515.00 TO NODE    520.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3236.00  DOWNSTREAM(FEET) =   3218.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   398.00   CHANNEL SLOPE =  0.0452
  CHANNEL BASE(FEET) =   30.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.985
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.89
  AVERAGE FLOW DEPTH(FEET) =   0.18   TRAVEL TIME(MIN.) =   3.51
  Tc(MIN.) =   13.55
  SUBAREA AREA(ACRES) =     5.60       SUBAREA RUNOFF(CFS) =    9.77
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        8.3         PEAK FLOW RATE(CFS) =      14.54

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   2.15
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    520.00 =     739.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    520.00 TO NODE    525.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3218.00  DOWNSTREAM(FEET) =   3208.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   233.00   CHANNEL SLOPE =  0.0429
  CHANNEL BASE(FEET) =   30.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.640
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.45
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.43
  AVERAGE FLOW DEPTH(FEET) =   0.27   TRAVEL TIME(MIN.) =   1.60
  Tc(MIN.) =   15.15
  SUBAREA AREA(ACRES) =     8.51       SUBAREA RUNOFF(CFS) =   13.82
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       16.8         PEAK FLOW RATE(CFS) =      27.35

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   2.67
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    525.00 =     972.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    525.00 TO NODE    530.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3208.00  DOWNSTREAM(FEET) =   3136.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1267.00   CHANNEL SLOPE =  0.0568
  CHANNEL BASE(FEET) =   30.00   "Z" FACTOR =   7.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.746
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      43.83
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.55
  AVERAGE FLOW DEPTH(FEET) =   0.38   TRAVEL TIME(MIN.) =   5.96
  Tc(MIN.) =   21.11
  SUBAREA AREA(ACRES) =    25.02       SUBAREA RUNOFF(CFS) =   32.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       41.9         PEAK FLOW RATE(CFS) =      54.89

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.43   FLOW VELOCITY(FEET/SEC.) =   3.85
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    530.00 =    2239.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    530.00 TO NODE    535.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3136.00  DOWNSTREAM(FEET) =   3062.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1438.00   CHANNEL SLOPE =  0.0515
  CHANNEL BASE(FEET) =   30.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.259
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     100.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.71
  AVERAGE FLOW DEPTH(FEET) =   0.64   TRAVEL TIME(MIN.) =   5.09
  Tc(MIN.) =   26.20
  SUBAREA AREA(ACRES) =    80.02       SUBAREA RUNOFF(CFS) =   91.27
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      121.9         PEAK FLOW RATE(CFS) =     139.02
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.78   FLOW VELOCITY(FEET/SEC.) =   5.29
  LONGEST FLOWPATH FROM NODE    500.00 TO NODE    535.00 =    3677.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      121.9  TC(MIN.) =     26.20
  PEAK FLOW RATE(CFS)   =     139.02
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 08-10-2009                                                              *
* BASIN 600                                                               *
 **************************************************************************

  FILE NAME: PR600.DAT
  TIME/DATE OF STUDY: 11:30 08/10/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3362.00
  DOWNSTREAM ELEVATION(FEET) =   3341.00
  ELEVATION DIFFERENCE(FEET) =     21.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.20

**************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3341.00  DOWNSTREAM(FEET) =   3324.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    62.00   CHANNEL SLOPE =  0.2742
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1881 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.20
  FLOW VELOCITY(FEET/SEC) =   2.43 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.43   Tc(MIN.) =    6.69
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     162.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.859
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.58
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.77
  TC(MIN.) =    6.69

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    604.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3324.00  DOWNSTREAM(FEET) =   3288.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   253.00   CHANNEL SLOPE =  0.1423
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1299 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.77
  FLOW VELOCITY(FEET/SEC) =   2.02 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =    8.78
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    604.00 =     415.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    604.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.596
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.39   SUBAREA RUNOFF(CFS) =    0.90
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       1.55
  TC(MIN.) =    8.78

****************************************************************************
  FLOW PROCESS FROM NODE    604.00 TO NODE    606.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3288.00  DOWNSTREAM(FEET) =   3286.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    65.00   CHANNEL SLOPE =  0.0308
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0308 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.55
  FLOW VELOCITY(FEET/SEC) =   1.14 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.95   Tc(MIN.) =    9.74
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    606.00 =     480.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    604.00 TO NODE    606.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.171
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    2.84   SUBAREA RUNOFF(CFS) =    6.13
  TOTAL AREA(ACRES) =        3.5   TOTAL RUNOFF(CFS) =       7.58
  TC(MIN.) =    9.74

****************************************************************************
  FLOW PROCESS FROM NODE    606.00 TO NODE    608.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3286.00  DOWNSTREAM(FEET) =   3260.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   348.00   CHANNEL SLOPE =  0.0747
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0747 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       7.58
  FLOW VELOCITY(FEET/SEC) =   3.01 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.93   Tc(MIN.) =   11.67
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    608.00 =     828.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    606.00 TO NODE    608.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.492
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    5.84   SUBAREA RUNOFF(CFS) =   11.23
  TOTAL AREA(ACRES) =        9.4   TOTAL RUNOFF(CFS) =      17.97
  TC(MIN.) =   11.67

****************************************************************************
  FLOW PROCESS FROM NODE    608.00 TO NODE    610.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3260.00  DOWNSTREAM(FEET) =   3228.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   419.00   CHANNEL SLOPE =  0.0764
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0764 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =      17.97
  FLOW VELOCITY(FEET/SEC) =   4.05 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.72   Tc(MIN.) =   13.39
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    610.00 =    1247.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    608.00 TO NODE    610.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.025
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =   19.32   SUBAREA RUNOFF(CFS) =   33.98
  TOTAL AREA(ACRES) =       28.7   TOTAL RUNOFF(CFS) =      50.42
  TC(MIN.) =   13.39

****************************************************************************
  FLOW PROCESS FROM NODE    610.00 TO NODE    612.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3228.00  DOWNSTREAM(FEET) =   3190.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   708.00   CHANNEL SLOPE =  0.0537
```

```
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.600
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      92.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.01
  AVERAGE FLOW DEPTH(FEET) =   1.07   TRAVEL TIME(MIN.) =   1.96
  Tc(MIN.) =   15.35
  SUBAREA AREA(ACRES) =    51.81       SUBAREA RUNOFF(CFS) =   83.42
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       80.5         PEAK FLOW RATE(CFS) =     129.58

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.29   FLOW VELOCITY(FEET/SEC.) =   6.65
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    612.00 =    1955.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    612.00 TO NODE    614.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3190.00  DOWNSTREAM(FEET) =   3082.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  2185.00   CHANNEL SLOPE =  0.0494
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.859
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     191.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   7.57
  AVERAGE FLOW DEPTH(FEET) =   1.68   TRAVEL TIME(MIN.) =   4.81
  Tc(MIN.) =   20.16
  SUBAREA AREA(ACRES) =    91.43       SUBAREA RUNOFF(CFS) =  123.48
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      171.9         PEAK FLOW RATE(CFS) =     232.17

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.86   FLOW VELOCITY(FEET/SEC.) =   7.99
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    614.00 =    4140.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    614.00 TO NODE    616.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3082.00  DOWNSTREAM(FEET) =   3042.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1069.00   CHANNEL SLOPE =  0.0374
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.568
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     295.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.84
  AVERAGE FLOW DEPTH(FEET) =   1.63   TRAVEL TIME(MIN.) =   2.61
  Tc(MIN.) =   22.77
  SUBAREA AREA(ACRES) =   101.50       SUBAREA RUNOFF(CFS) =  126.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      273.4         PEAK FLOW RATE(CFS) =     341.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.77   FLOW VELOCITY(FEET/SEC.) =   7.14
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    616.00 =    5209.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    616.00 TO NODE    616.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
```

```
==========================================================================

**************************************************************************
  FLOW PROCESS FROM NODE    616.00 TO NODE    616.00 IS CODE =  13
--------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
==========================================================================

**************************************************************************
  FLOW PROCESS FROM NODE    618.00 TO NODE    620.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.00
  UPSTREAM ELEVATION(FEET) =   3433.90
  DOWNSTREAM ELEVATION(FEET) =   3404.90
  ELEVATION DIFFERENCE(FEET) =     29.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.879
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.545
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.36

**************************************************************************
  FLOW PROCESS FROM NODE    620.00 TO NODE    622.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3404.90  DOWNSTREAM(FEET) =   3360.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   136.00   CHANNEL SLOPE =  0.3301
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2018 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.36
  FLOW VELOCITY(FEET/SEC) =   2.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.90   Tc(MIN.) =    6.78
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    622.00 =     224.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    620.00 TO NODE    622.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.794
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.43   SUBAREA RUNOFF(CFS) =    1.17
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.50
  TC(MIN.) =    6.78

**************************************************************************
  FLOW PROCESS FROM NODE    622.00 TO NODE    626.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3265.00  DOWNSTREAM(FEET) =   3205.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   638.00   CHANNEL SLOPE =  0.0940
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .0940 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  CHANNEL FLOW THRU SUBAREA(CFS) =       1.50
  FLOW VELOCITY(FEET/SEC) =   1.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.41   Tc(MIN.) =   12.19
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    626.00 =     862.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    622.00 TO NODE    626.00 IS CODE =  81
--------------------------------------------------------------------------
```

```
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.339
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    1.69   SUBAREA RUNOFF(CFS) =    3.16
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       4.19
  TC(MIN.) =   12.19

********************************************************************************
  FLOW PROCESS FROM NODE    626.00 TO NODE    628.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3205.00  DOWNSTREAM(FEET) =   3150.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   509.00   CHANNEL SLOPE =  0.1081
  CHANNEL BASE(FEET) =   50.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.429
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      10.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.07
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   4.09
  Tc(MIN.) =   16.28
  SUBAREA AREA(ACRES) =     8.25       SUBAREA RUNOFF(CFS) =   12.79
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       10.5         PEAK FLOW RATE(CFS) =      16.26

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.44
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    628.00 =    1371.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    628.00 TO NODE    630.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3150.00  DOWNSTREAM(FEET) =   3095.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   741.00   CHANNEL SLOPE =  0.0742
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.027
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      28.37
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.76
  AVERAGE FLOW DEPTH(FEET) =   0.52   TRAVEL TIME(MIN.) =   2.59
  Tc(MIN.) =   18.87
  SUBAREA AREA(ACRES) =    17.17       SUBAREA RUNOFF(CFS) =   24.20
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       27.7         PEAK FLOW RATE(CFS) =      38.98

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.62   FLOW VELOCITY(FEET/SEC.) =   5.29
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    630.00 =    2112.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    630.00 TO NODE    632.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3095.00  DOWNSTREAM(FEET) =   3060.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   569.00   CHANNEL SLOPE =  0.0615
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.794
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      59.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.19
  AVERAGE FLOW DEPTH(FEET) =   0.67   TRAVEL TIME(MIN.) =   1.83
  Tc(MIN.) =   20.70
  SUBAREA AREA(ACRES) =    30.93       SUBAREA RUNOFF(CFS) =   41.07
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       58.6         PEAK FLOW RATE(CFS) =      77.79

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.78   FLOW VELOCITY(FEET/SEC.) =   5.73
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    632.00 =    2681.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    633.00 TO NODE    633.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.794
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3800
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3550
  SUBAREA AREA(ACRES) =   11.71   SUBAREA RUNOFF(CFS) =   16.88
  TOTAL AREA(ACRES) =       70.3   TOTAL RUNOFF(CFS) =      94.67
  TC(MIN.) =   20.70

****************************************************************************
  FLOW PROCESS FROM NODE    632.00 TO NODE    616.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3060.00  DOWNSTREAM(FEET) =   3042.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   342.00   CHANNEL SLOPE =  0.0526
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   9.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.669
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .5900
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      96.99
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.20
  AVERAGE FLOW DEPTH(FEET) =   0.99   TRAVEL TIME(MIN.) =   1.10
  Tc(MIN.) =   21.80
  SUBAREA AREA(ACRES) =     2.14       SUBAREA RUNOFF(CFS) =    4.63
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.362
  TOTAL AREA(ACRES) =       72.4         PEAK FLOW RATE(CFS) =      96.21

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.98   FLOW VELOCITY(FEET/SEC.) =   5.21
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    616.00 =    3023.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    616.00 TO NODE    616.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       96.21    21.80       3.669       72.44
  LONGEST FLOWPATH FROM NODE    618.00 TO NODE    616.00 =    3023.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1      341.41    22.77       3.568      273.41
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    616.00 =    5209.00 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1     423.06      21.80        3.669
      2     434.95      22.77        3.568

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     434.95   Tc(MIN.) =   22.77
  TOTAL AREA(ACRES) =      345.9

****************************************************************************
  FLOW PROCESS FROM NODE    616.00 TO NODE    634.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3042.00  DOWNSTREAM(FEET) =   3032.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   259.00   CHANNEL SLOPE =  0.0386
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.516
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3900
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     442.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.29
  AVERAGE FLOW DEPTH(FEET) =   2.61   TRAVEL TIME(MIN.) =   0.52
  Tc(MIN.) =   23.29
  SUBAREA AREA(ACRES) =    11.15       SUBAREA RUNOFF(CFS) =   15.29
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.354
  TOTAL AREA(ACRES) =      357.0         PEAK FLOW RATE(CFS) =     443.94

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  2.61   FLOW VELOCITY(FEET/SEC.) =   8.30
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    634.00 =    5468.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =      357.0  TC(MIN.) =     23.29
  PEAK FLOW RATE(CFS)   =     443.94
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 05-21-2009                                                              *
* BASIN 700                                                               *
 **************************************************************************

  FILE NAME: PR700.DAT
  TIME/DATE OF STUDY: 09:17 05/21/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    700.00 TO NODE    702.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3450.00
  DOWNSTREAM ELEVATION(FEET) =   3434.00
  ELEVATION DIFFERENCE(FEET) =     16.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

**************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    704.00 IS CODE =  53
--------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3434.00  DOWNSTREAM(FEET) =   3416.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    92.00   CHANNEL SLOPE =  0.1957
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .1578 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.11
  FLOW VELOCITY(FEET/SEC) =   2.22 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.69   Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    704.00 =     192.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    702.00 TO NODE    704.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.666
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.10   SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.38
  TC(MIN.) =    6.96

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    706.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3416.00  DOWNSTREAM(FEET) =   3370.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00   CHANNEL SLOPE =  0.3485
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2050 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.38
  FLOW VELOCITY(FEET/SEC) =   2.54 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.87   Tc(MIN.) =    7.82
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    706.00 =     324.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    704.00 TO NODE    706.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.106
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.20   SUBAREA RUNOFF(CFS) =    0.50
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       0.85
  TC(MIN.) =    7.82

****************************************************************************
  FLOW PROCESS FROM NODE    706.00 TO NODE    708.00 IS CODE =  53
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3370.00  DOWNSTREAM(FEET) =   3272.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   294.00   CHANNEL SLOPE =  0.3333
  SLOPE ADJUSTMENT CURVE USED:
  EFFECTIVE SLOPE = .2023 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.85
  FLOW VELOCITY(FEET/SEC) =   2.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =    9.77
  LONGEST FLOWPATH FROM NODE    700.00 TO NODE    708.00 =     618.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    706.00 TO NODE    708.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.158
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) =    0.64   SUBAREA RUNOFF(CFS) =    1.38
TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.11
TC(MIN.) =    9.77

****************************************************************************
FLOW PROCESS FROM NODE    708.00 TO NODE    710.00 IS CODE =  53
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL MOUNTAIN CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   3272.00  DOWNSTREAM(FEET) =   3214.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   192.00   CHANNEL SLOPE =  0.3021
SLOPE ADJUSTMENT CURVE USED:
EFFECTIVE SLOPE = .1955 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
CHANNEL FLOW THRU SUBAREA(CFS) =       2.11
FLOW VELOCITY(FEET/SEC) =   3.18 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   1.01   Tc(MIN.) =   10.78
LONGEST FLOWPATH FROM NODE    700.00 TO NODE    710.00 =     810.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    708.00 TO NODE    710.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.780
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
SUBAREA AREA(ACRES) =    2.66   SUBAREA RUNOFF(CFS) =    5.38
TOTAL AREA(ACRES) =        3.6   TOTAL RUNOFF(CFS) =       7.36
TC(MIN.) =   10.78

****************************************************************************
FLOW PROCESS FROM NODE    710.00 TO NODE    712.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   3214.00  DOWNSTREAM(FEET) =   3100.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   418.00   CHANNEL SLOPE =  0.2727
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   3.000
MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.362
NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  88
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.62
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.24
AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   1.33
Tc(MIN.) =   12.11
SUBAREA AREA(ACRES) =     4.53       SUBAREA RUNOFF(CFS) =    8.50
AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
TOTAL AREA(ACRES) =        8.2         PEAK FLOW RATE(CFS) =      15.33

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   5.78
LONGEST FLOWPATH FROM NODE    700.00 TO NODE    712.00 =    1228.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    712.00 TO NODE    714.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   3100.00  DOWNSTREAM(FEET) =   3068.00
CHANNEL LENGTH THRU SUBAREA(FEET) =   172.15   CHANNEL SLOPE =  0.1859
CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   3.00
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.219
 NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  88
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      19.66
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.53
 AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =   0.52
 Tc(MIN.) =   12.63
 SUBAREA AREA(ACRES) =     4.74       SUBAREA RUNOFF(CFS) =    8.66
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
 TOTAL AREA(ACRES) =       12.9         PEAK FLOW RATE(CFS) =      23.58

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   5.84
 LONGEST FLOWPATH FROM NODE    700.00 TO NODE    714.00 =    1400.15 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       12.9  TC(MIN.) =     12.63
 PEAK FLOW RATE(CFS)   =      23.58
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                             Analysis prepared by:

                             Nolte Associates, Inc.
                            15070 Avenue of Science
                                  Suite 100
                              San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-9-2009                                                               *
* BASIN 800: CFS/AC RATIO TO BE USED FOR CULVERTS W/BASINS UP TO 6 AC     *
 **************************************************************************

  FILE NAME: PR800.DAT
  TIME/DATE OF STUDY: 16:44 11/11/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    800.00 TO NODE    805.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3243.00
  DOWNSTREAM ELEVATION(FEET) =   3231.80
  ELEVATION DIFFERENCE(FEET) =     11.20
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

**************************************************************************
  FLOW PROCESS FROM NODE    805.00 TO NODE    810.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3231.80  DOWNSTREAM(FEET) =   3210.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    88.80   CHANNEL SLOPE =  0.2455
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.146
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.20
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.99
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =   1.49
  Tc(MIN.) =    7.76
  SUBAREA AREA(ACRES) =     0.07       SUBAREA RUNOFF(CFS) =    0.18
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    810.00 =     188.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    810.00 TO NODE    815.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3210.00  DOWNSTREAM(FEET) =   3178.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   145.10   CHANNEL SLOPE =  0.2205
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.394
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.66
  AVERAGE FLOW DEPTH(FEET) =   0.04   TRAVEL TIME(MIN.) =   1.46
  Tc(MIN.) =    9.21
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.58
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       0.83

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.05   FLOW VELOCITY(FEET/SEC.) =   1.95
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    815.00 =     333.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    815.00 TO NODE    820.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3178.00  DOWNSTREAM(FEET) =   3154.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   140.70   CHANNEL SLOPE =  0.1706
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.850
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.72
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   1.36
  Tc(MIN.) =   10.58
  SUBAREA AREA(ACRES) =     0.19       SUBAREA RUNOFF(CFS) =    0.39
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.86
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    820.00 =     474.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    820.00 TO NODE    825.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3154.00  DOWNSTREAM(FEET) =   3148.79
  CHANNEL LENGTH THRU SUBAREA(FEET) =    37.30   CHANNEL SLOPE =  0.1397
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.734
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.09
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.86
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   0.33
  Tc(MIN.) =   10.91
  SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.5         PEAK FLOW RATE(CFS) =       3.01

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.14
  LONGEST FLOWPATH FROM NODE    800.00 TO NODE    825.00 =     511.90 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.5  TC(MIN.) =     10.91
  PEAK FLOW RATE(CFS)   =       3.01
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                              Analysis prepared by:

                              Nolte Associates, Inc.
                             15070 Avenue of Science
                                    Suite 100
                               San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-9-2009                                                               *
* BASIN 900: CFS/AC RATIO USED FOR CULVERTS W/BASINS BTWN 7-9AC           *
 *************************************************************************

  FILE NAME: PR900.DAT
  TIME/DATE OF STUDY: 16:35 11/11/2009
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

**************************************************************************
  FLOW PROCESS FROM NODE    900.00 TO NODE    905.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   3250.00
  DOWNSTREAM ELEVATION(FEET) =   3232.00
  ELEVATION DIFFERENCE(FEET) =     18.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.200
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

**************************************************************************
  FLOW PROCESS FROM NODE    905.00 TO NODE    910.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3232.00  DOWNSTREAM(FEET) =   3200.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =   110.60   CHANNEL SLOPE =  0.2893
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.883
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.24
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.94
  AVERAGE FLOW DEPTH(FEET) =   0.01   TRAVEL TIME(MIN.) =   1.95
  Tc(MIN.) =    8.22
  SUBAREA AREA(ACRES) =     0.10       SUBAREA RUNOFF(CFS) =    0.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.34

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.02   FLOW VELOCITY(FEET/SEC.) =   0.91
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    910.00 =     210.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    910.00 TO NODE    915.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3200.00  DOWNSTREAM(FEET) =   3166.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   115.60   CHANNEL SLOPE =  0.2941
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.117
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.62
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.17
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   1.65
  Tc(MIN.) =    9.87
  SUBAREA AREA(ACRES) =     0.26       SUBAREA RUNOFF(CFS) =    0.56
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       0.86

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   1.51
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    915.00 =     326.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    915.00 TO NODE    920.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3166.00  DOWNSTREAM(FEET) =   3150.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    56.80   CHANNEL SLOPE =  0.2817
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.968
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.51
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.46
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.39
  Tc(MIN.) =   10.26
  SUBAREA AREA(ACRES) =     0.63       SUBAREA RUNOFF(CFS) =    1.32
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       2.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.07   FLOW VELOCITY(FEET/SEC.) =   2.73
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    920.00 =     383.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    920.00 TO NODE    925.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3150.00  DOWNSTREAM(FEET) =   3110.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   146.70   CHANNEL SLOPE =  0.2727
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   6.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.759
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.20
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.58
  Tc(MIN.) =   10.84
  SUBAREA AREA(ACRES) =     2.42       SUBAREA RUNOFF(CFS) =    4.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.5         PEAK FLOW RATE(CFS) =       6.95

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   4.79
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    925.00 =     529.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    925.00 TO NODE    930.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3110.00  DOWNSTREAM(FEET) =   3094.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   126.00   CHANNEL SLOPE =  0.1270
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.601
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.38
  AVERAGE FLOW DEPTH(FEET) =   0.32   TRAVEL TIME(MIN.) =   0.48
  Tc(MIN.) =   11.32
  SUBAREA AREA(ACRES) =     1.30       SUBAREA RUNOFF(CFS) =    2.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =       9.31

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.34   FLOW VELOCITY(FEET/SEC.) =   4.57
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    930.00 =     655.70 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    930.00 TO NODE    935.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3094.00  DOWNSTREAM(FEET) =   3067.81
  CHANNEL LENGTH THRU SUBAREA(FEET) =   361.50   CHANNEL SLOPE =  0.0724
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.450
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.13
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.31
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   0.49
  Tc(MIN.) =   11.81
  SUBAREA AREA(ACRES) =     2.96       SUBAREA RUNOFF(CFS) =    5.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        7.7         PEAK FLOW RATE(CFS) =      14.71

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.46   FLOW VELOCITY(FEET/SEC.) =  12.97
  LONGEST FLOWPATH FROM NODE    900.00 TO NODE    935.00 =    1017.20 FEET.
```

```
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =         7.7  TC(MIN.) =     11.81
  PEAK FLOW RATE(CFS)   =      14.71
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2008 Advanced Engineering Software (aes)
              Ver. 15.0 Release Date: 04/01/2008  License ID 1504

                             Analysis prepared by:

                             Nolte Associates, Inc.
                            15070 Avenue of Science
                                  Suite 100
                              San Diego, CA 92128

 ************************** DESCRIPTION OF STUDY **************************
* SDB039600                                                               *
* 11-9-2009                                                               *
* BASIN 1000: CFS/AC RATIO USED FOR CULVERTS W/BASINS BTWN 17-23AC        *
 ****************************************************************************

  FILE NAME: PR1000.DAT
  TIME/DATE OF STUDY: 11:49 11/12/2009
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.600
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0     11.0    0.018/0.018/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1005.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.90
  UPSTREAM ELEVATION(FEET) =   3362.00
  DOWNSTREAM ELEVATION(FEET) =   3328.00
  ELEVATION DIFFERENCE(FEET) =     34.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.137
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.311
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE   1005.00 TO NODE   1010.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3328.00  DOWNSTREAM(FEET) =   3314.00
```

```
  CHANNEL LENGTH THRU SUBAREA(FEET) =    76.70   CHANNEL SLOPE =  0.1825
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.166
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.30
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.81
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =   1.59
  Tc(MIN.) =    7.72
  SUBAREA AREA(ACRES) =     0.12       SUBAREA RUNOFF(CFS) =    0.30
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       0.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.02   FLOW VELOCITY(FEET/SEC.) =   1.04
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1010.00 =     172.60 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1010.00 TO NODE   1015.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3314.00  DOWNSTREAM(FEET) =   3310.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    32.80   CHANNEL SLOPE =  0.1220
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   6.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.970
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.62
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.34
  Tc(MIN.) =    8.06
  SUBAREA AREA(ACRES) =     1.22       SUBAREA RUNOFF(CFS) =    2.98
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       3.39

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   1.90
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1015.00 =     205.40 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1015.00 TO NODE   1020.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3310.00  DOWNSTREAM(FEET) =   3290.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   195.60   CHANNEL SLOPE =  0.1022
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =   6.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.251
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.07
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.20
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   1.48
  Tc(MIN.) =    9.54
  SUBAREA AREA(ACRES) =     1.54       SUBAREA RUNOFF(CFS) =    3.37
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        2.9         PEAK FLOW RATE(CFS) =       6.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.33
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1020.00 =     401.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1020.00 TO NODE   1025.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3290.00  DOWNSTREAM(FEET) =   3188.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   502.90   CHANNEL SLOPE =  0.2028
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.540
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.61
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.26
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   1.97
  Tc(MIN.) =   11.51
  SUBAREA AREA(ACRES) =     2.26       SUBAREA RUNOFF(CFS) =    4.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        5.2         PEAK FLOW RATE(CFS) =      10.06

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.23   FLOW VELOCITY(FEET/SEC.) =   4.41
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1025.00 =     903.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1025.00 TO NODE   1030.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3188.00  DOWNSTREAM(FEET) =   3174.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    53.70   CHANNEL SLOPE =  0.2607
  CHANNEL BASE(FEET) =    8.00   "Z" FACTOR =   8.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.494
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      18.90
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.00
  AVERAGE FLOW DEPTH(FEET) =   0.30   TRAVEL TIME(MIN.) =   0.15
  Tc(MIN.) =   11.66
  SUBAREA AREA(ACRES) =     9.19       SUBAREA RUNOFF(CFS) =   17.67
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       14.4         PEAK FLOW RATE(CFS) =      27.65

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.38   FLOW VELOCITY(FEET/SEC.) =   6.66
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1030.00 =     957.60 FEET.

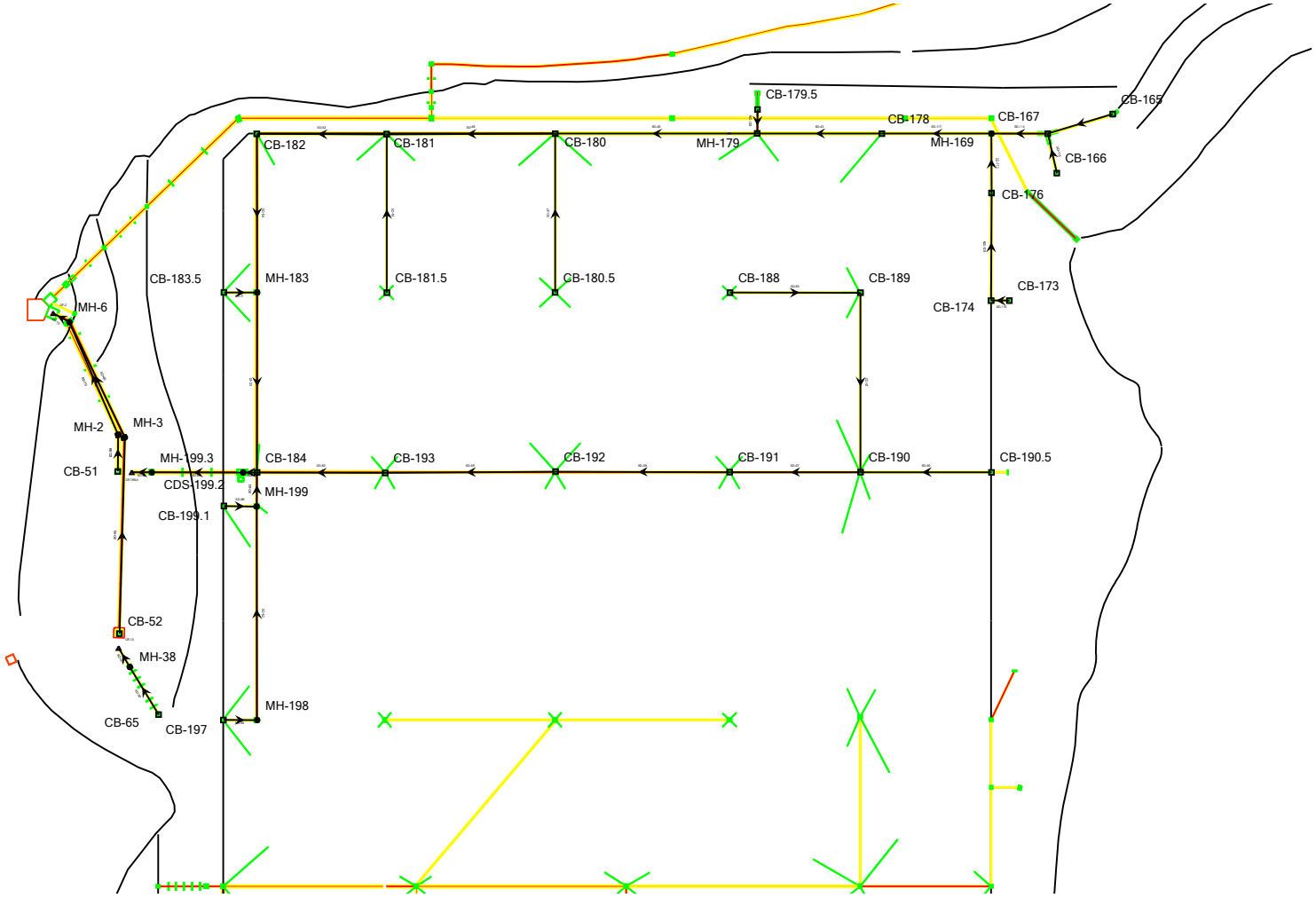
****************************************************************************
  FLOW PROCESS FROM NODE   1030.00 TO NODE   1035.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   3174.00  DOWNSTREAM(FEET) =   3121.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =   508.70   CHANNEL SLOPE =  0.1027
  CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.050   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.030
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      31.74
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.96
  AVERAGE FLOW DEPTH(FEET) =   0.55   TRAVEL TIME(MIN.) =   1.71
  Tc(MIN.) =   13.37
  SUBAREA AREA(ACRES) =     4.65       SUBAREA RUNOFF(CFS) =    8.19
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       19.0         PEAK FLOW RATE(CFS) =      33.50

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.57   FLOW VELOCITY(FEET/SEC.) =   5.03
  LONGEST FLOWPATH FROM NODE   1000.00 TO NODE   1035.00 =    1466.30 FEET.
```

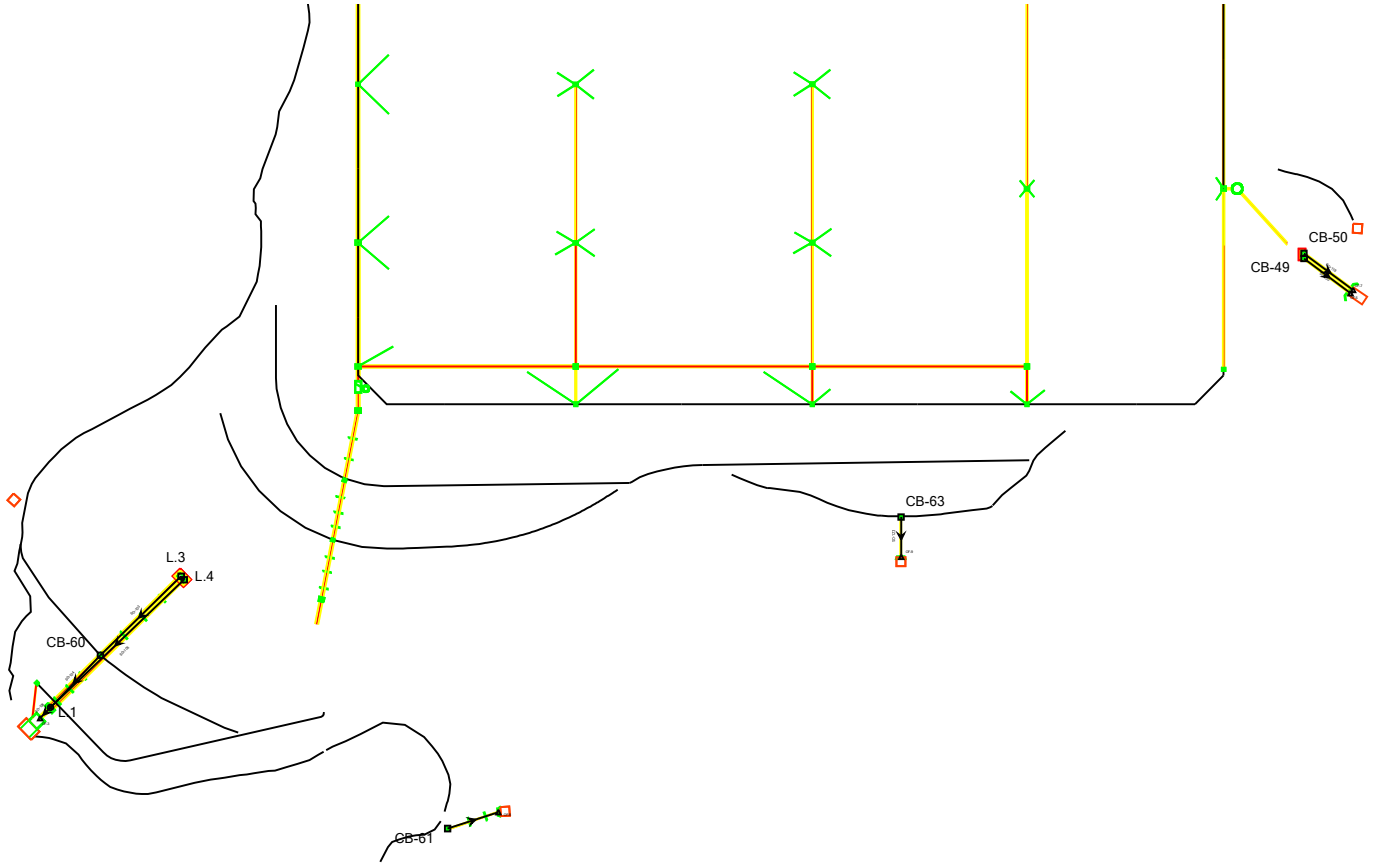
```
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       19.0  TC(MIN.) =     13.37
  PEAK FLOW RATE(CFS)   =      33.50
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

HYDRAULIC CALCULATIONS

Scenario: 100yr Basin 100



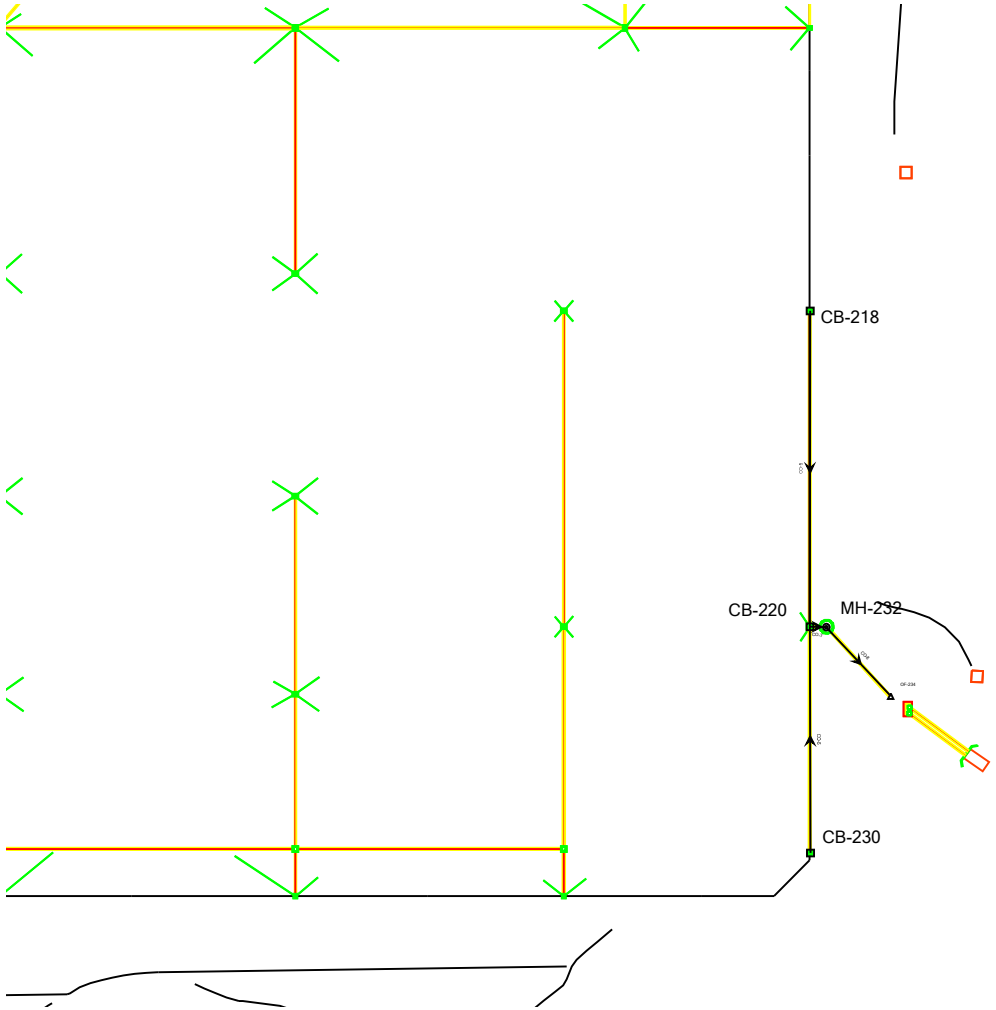
Scenario: 100yr Basin 100



FlexTable: Conduit Table (Rev Basin 100.stc)

Label	Start Node	Invert (Upstream) (ft)	Stop Node	Invert (Downstream) (ft)	Manning's n	Section Size	Diameter (in)	Flow (ft³/s)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (Average) (ft/s)
SD-64	CDS-199.2	3,034.55	MH-199.3	3,011.11	0.012	42 inch	42.0	58.05	104.8	0.224	3,056.30	3,017.80	3,036.94	3,016.48	18.25	3.19	35.46
SD-68	MH-199.3	3,011.11	OF-199.4	3,011.00	0.013	42 inch	42.0	58.05	22.8	0.005	3,017.80	3,011.00	3,016.20	3,016.12	3.19	-3.50	6.03
SD-57	CB-190	3,047.22	CB-191	3,046.43	0.012	18 inch	18.0	9.34	159.3	0.005	3,055.75	3,055.56	3,048.78	3,047.61	7.03	7.63	5.29
SD-56	CB-190.5	3,048.87	CB-190	3,048.08	0.012	18 inch	18.0	1.91	159.6	0.005	3,055.62	3,055.75	3,049.43	3,049.43	5.25	6.17	3.72
SD-55	CB-188	3,049.72	CB-189	3,048.90	0.012	18 inch	18.0	2.61	158.5	0.005	3,056.22	3,056.22	3,050.33	3,050.03	5.00	5.82	4.12
SD-41	CB-189	3,048.60	CB-190	3,047.50	0.012	18 inch	18.0	4.90	219.0	0.005	3,056.22	3,055.75	3,049.78	3,049.43	6.12	6.75	4.78
SD-71	CB-183.5	3,051.81	MH-183	3,051.60	0.012	18 inch	18.0	2.01	38.0	0.006	3,056.31	3,056.91	3,052.34	3,052.10	3.00	3.81	3.93
SD-94	CB-197	3,051.64	MH-198	3,051.40	0.012	18 inch	18.0	2.60	38.0	0.006	3,056.14	3,056.82	3,052.25	3,051.95	3.00	3.92	4.42
SD-43	CB-178	3,048.57	MH-179	3,047.82	0.012	36 inch	36.0	24.37	150.2	0.005	3,056.45	3,056.00	3,050.26	3,050.31	4.88	5.18	7.14
SD-47	CB-180.5	3,049.72	CB-180	3,048.70	0.012	18 inch	18.0	3.58	193.5	0.005	3,056.22	3,056.28	3,050.44	3,049.39	5.00	6.08	4.51
SD-46	MH-179	3,047.52	CB-180	3,046.28	0.012	36 inch	36.0	28.51	246.8	0.005	3,056.00	3,056.28	3,049.25	3,049.01	5.48	7.00	7.44
SD-58	CB-191	3,045.93	CB-192	3,044.87	0.012	24 inch	24.0	12.99	212.2	0.005	3,055.56	3,055.56	3,047.23	3,046.45	7.63	8.69	6.05
SD-59	CB-192	3,044.57	CB-193	3,043.53	0.012	24 inch	24.0	16.62	207.3	0.005	3,055.56	3,055.58	3,046.14	3,045.00	8.99	10.05	6.29
SD-60	CB-193	3,042.53	CB-184	3,041.76	0.012	36 inch	36.0	19.82	154.2	0.005	3,055.58	3,056.62	3,044.38	3,044.38	10.05	11.86	6.77
SD-61	MH-183	3,042.32	CB-184	3,041.22	0.012	42 inch	42.0	39.80	219.0	0.005	3,056.91	3,056.62	3,044.28	3,044.38	11.09	11.90	8.09
SD-67	CB-184	3,040.92	CDS-199.2	3,040.87	0.012	42 inch	42.0	58.05	9.0	0.006	3,056.62	3,056.30	3,043.31	3,043.16	12.20	11.93	9.18
SD-129	CB-179.5	3,052.28	MH-179	3,049.54	0.012	18 inch	18.0	2.54	27.1	0.101	3,060.58	3,056.00	3,052.88	3,050.31	6.80	4.96	11.80
SD-54	CB-182	3,043.58	MH-183	3,042.62	0.012	42 inch	42.0	37.79	193.5	0.005	3,056.60	3,056.91	3,045.49	3,044.84	9.52	10.79	7.95
SD-48	CB-180	3,045.98	CB-181	3,044.96	0.012	36 inch	36.0	33.31	205.0	0.005	3,056.28	3,056.29	3,048.10	3,047.92	7.30	8.33	7.68
SD-51	CB-181.5	3,049.73	CB-181	3,048.70	0.012	18 inch	18.0	2.96	193.5	0.005	3,056.23	3,056.29	3,050.38	3,049.32	5.00	6.09	4.30
SD-52	CB-181	3,044.66	CB-182	3,043.88	0.012	36 inch	36.0	37.39	156.5	0.005	3,056.29	3,056.60	3,046.80	3,046.64	8.63	9.72	7.88
SD-89	CB-199.1	3,051.60	MH-199	3,051.40	0.012	18 inch	18.0	3.26	38.0	0.005	3,055.82	3,056.62	3,052.29	3,052.06	2.72	3.72	4.40
SD-63	MH-199	3,048.58	CB-184	3,048.39	0.012	18 inch	18.0	5.86	38.2	0.005	3,056.62	3,056.62	3,049.53	3,049.32	6.54	6.73	4.96
SD-62	MH-198	3,050.19	MH-199	3,048.88	0.012	18 inch	18.0	2.60	260.8	0.005	3,056.82	3,056.62	3,050.80	3,049.76	5.13	6.24	4.07
SD-69	CB-51	3,003.01	MH-2	3,002.81	0.012	36 inch	36.0	24.64	41.0	0.005	3,011.00	3,017.82	3,004.61	3,004.30	4.99	12.01	7.09
SD-70	MH-2	3,000.54	MH-6	2,962.10	0.012	36 inch	36.0	24.64	151.5	0.254	3,017.82	2,970.00	3,002.14	2,964.02	14.28	4.90	29.37
SD-73	MH-6	2,962.06	OF-2	2,961.94	0.013	48	48.0	42.84	15.8	0.008	2,970.00	2,960.12	2,964.02	2,963.71	3.94	-5.82	9.02
SD-65	CB-52	3,004.00	MH-3	3,002.81	0.012	36 inch	36.0	18.20	237.8	0.005	3,010.00	3,017.75	3,005.37	3,004.19	3.00	11.94	6.62
SD-66	MH-3	3,002.51	MH-6	2,962.10	0.012	36 inch	36.0	18.20	159.2	0.254	3,017.75	2,970.00	3,003.88	2,964.02	12.24	4.90	26.83
SD-103	L.3	2,953.23	CB-60	2,917.96	0.012	36 inch	36.0	53.80	119.3	0.296	2,960.20	2,944.37	2,955.61	2,920.98	3.97	23.41	38.94
SD-104	CB-60	2,917.96	L.1	2,890.09	0.012	36 inch	36.0	54.44	80.3	0.347	2,944.37	2,899.53	2,920.36	2,893.79	23.41	6.44	41.36
SD-105	L.4	2,953.23	L.1	2,890.09	0.012	36 inch	36.0	57.47	199.6	0.316	2,960.20	2,899.53	2,955.69	2,893.79	3.97	6.44	40.65
SD-106	L.1	2,889.79	OF-3	2,889.66	0.013	48	48.0	111.91	12.8	0.010	2,899.53	2,887.90	2,892.99	2,892.63	5.74	-5.76	12.71
SD-109	CB-174	3,052.90	CB-176	3,052.25	0.012	12 inch	12.0	2.87	132.1	0.005	3,056.07	3,056.70	3,054.46	3,053.73	2.17	3.45	3.65
SD-112	CB-176	3,051.75	MH-169	3,051.40	0.012	18 inch	18.0	3.46	70.5	0.005	3,056.70	3,057.70	3,053.23	3,053.17	3.45	4.80	4.37
SD-113	CB-165	3,051.56	CB-167	3,051.16	0.012	24 inch	24.0	10.31	81.0	0.005	3,058.64	3,056.10	3,055.13	3,054.99	5.08	2.94	3.28
SD-114	CB-167	3,050.86	MH-169	3,050.53	0.012	24 inch	24.0	17.18	66.4	0.005	3,056.10	3,057.70	3,053.49	3,053.17	3.24	5.17	5.47
SD-115	CB-166	3,051.39	CB-167	3,051.16	0.012	24 inch	24.0	5.00	46.8	0.005	3,056.95	3,056.10	3,055.01	3,054.99	3.56	2.94	1.59
SD-116	CB-173	3,053.31	CB-174	3,053.20	0.012	12 inch	12.0	1.39	21.4	0.005	3,054.31	3,056.07	3,054.80	3,054.77	0.00	1.87	1.77
SD-117	MH-169	3,050.23	CB-178	3,049.57	0.012	24 inch	24.0	20.64	132.0	0.005	3,057.70	3,056.45	3,052.27	3,051.20	5.47	4.88	6.57
SD-119	CB-50	3,038.00	OF-7	3,037.59	0.012	18 inch	18.0	0.94	62.8	0.007	3,042.90	3,037.59	3,038.36	3,037.91	3.40	-1.50	3.35
SD-120	CB-49	3,037.98	OF-5	3,037.59	0.012	18 inch	18.0	3.48	59.8	0.007	3,042.90	3,037.59	3,038.69	3,038.23	3.42	-1.50	4.84
SD-110	CB-61	2,935.76	OF-8	2,928.23	0.012	12 inch	12.0	0.62	57.1	0.132	2,939.62	2,931.00	2,936.09	2,928.37	2.86	1.77	8.95
SD-123	CB-63	2,982.76	OF-9	2,982.53	0.012	12 inch	12.0	0.73	42.4	0.005	3,014.35	2,984.00	2,983.12	2,982.88	30.59	0.47	3.03
SD-30	CB-65	3,037.82	MH-38	3,012.68	0.012	18 inch	18.0	0.82	65.1	0.386	3,043.00	3,017.80	3,038.16	3,016.62	3.68	3.62	13.44
SD-30A	MH-38	3,010.14	OF-10	3,010.00	0.012	18 inch	18.0	0.82	25.5	0.005	3,017.80	3,012.00	3,016.12	3,016.12	6.16	0.50	0.46

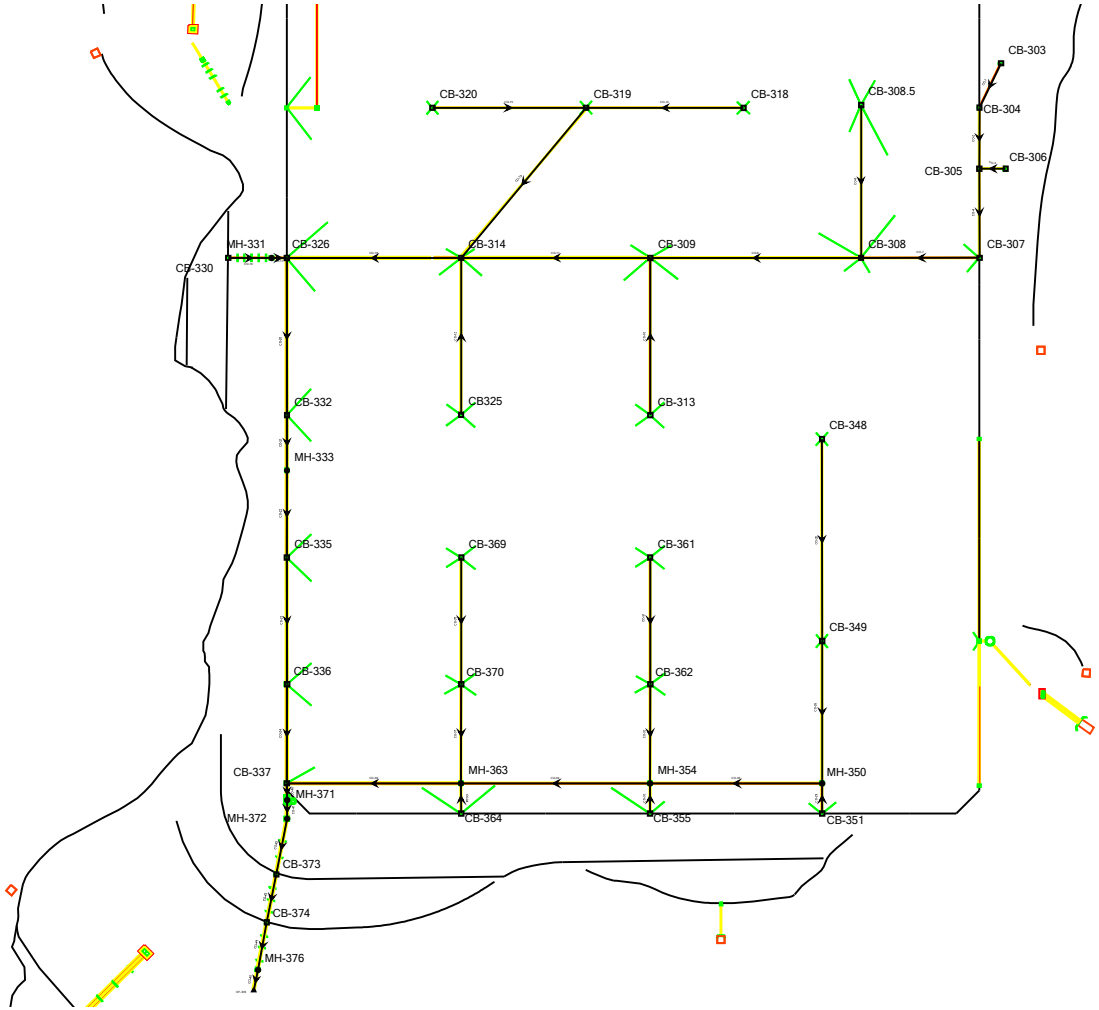
Scenario: Proposed 100-Year



FlexTable: Conduit Table (Basin200.stc)

Label	Start Node	Invert (Upstream) (ft)	Stop Node	Invert (Downstream) (ft)	Manning's n	Section Size	Diameter (in)	Flow (ft^3/s)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (Average) (ft/s)
CO-5	CB-218	3,049.54	CB-220	3,048.17	0.012	18 inch	18.0	2.69	274.5	0.005	3,056.04	3,055.28	3,050.16	3,049.47	5.00	5.61	4.10
CO-6	CB-230	3,049.85	CB-220	3,048.88	0.012	18 inch	18.0	1.50	195.5	0.005	3,056.60	3,055.28	3,050.31	3,049.47	5.25	4.90	3.48
CO-7	CB-220	3,043.48	MH-232	3,043.44	0.013	24 inch	24.0	5.59	7.5	0.005	3,055.28	3,056.36	3,049.40	3,049.40	9.80	10.92	1.78
CO-8	MH-232	3,043.44	OF-234	3,043.00	0.013	24 inch	24.0	5.59	76.4	0.006	3,056.36	3,048.00	3,048.44	3,048.39	10.92	3.00	1.78

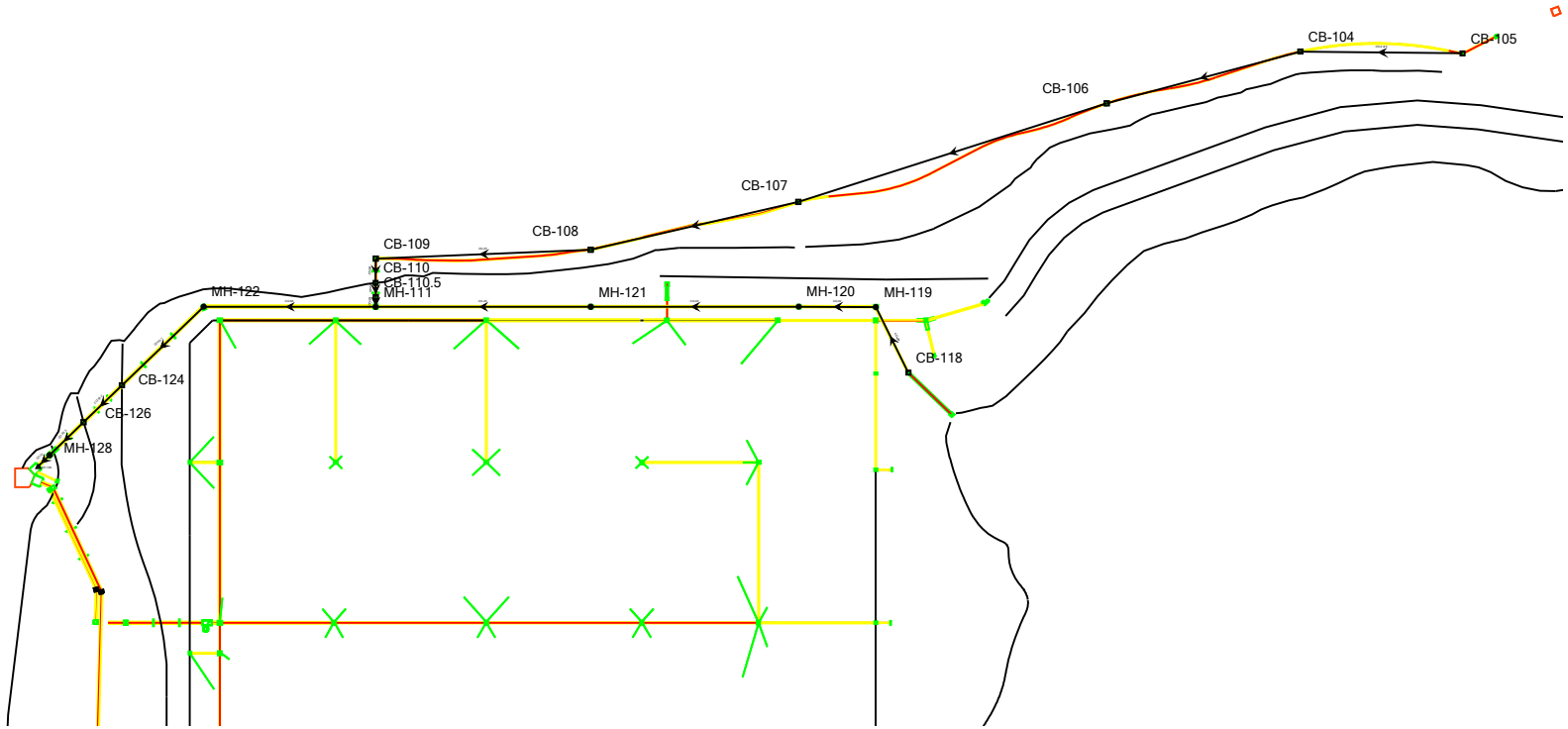
Scenario: Proposed 100-Yr



FlexTable: Conduit Table (Basin300.stc)

Label	Start Node	Invert (Upstream) (ft)	Stop Node	Invert (Downstream) (ft)	Manning's n	Section Size	Diameter (in)	Flow (ft³/s)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (Average) (ft/s)
CO-1	CB-303	3,053.38	CB-304	3,051.31	0.012	12 inch	12.0	1.38	66.0	0.031	3,057.40	3,056.14	3,053.88	3,052.30	3.02	3.83	6.81
CO-2	CB-304	3,050.81	CB-305	3,050.40	0.012	18 inch	18.0	3.56	82.7	0.005	3,056.14	3,057.19	3,052.23	3,052.15	3.83	5.29	4.40
CO-3	CB-306	3,051.50	CB-305	3,050.40	0.012	18 inch	18.0	2.58	24.7	0.045	3,056.50	3,057.19	3,052.11	3,052.15	3.50	5.29	8.88
CO-4	CB-305	3,050.40	CB-307	3,049.79	0.012	18 inch	18.0	5.95	120.9	0.005	3,057.19	3,056.22	3,051.89	3,051.56	5.29	4.93	5.00
CO-7	CB-307	3,049.51	CB-308	3,048.71	0.012	18 inch	18.0	7.86	159.5	0.005	3,056.22	3,055.87	3,051.10	3,050.34	5.21	5.66	4.45
CO-8	CB-308.5	3,049.77	CB-308	3,048.70	0.012	18 inch	18.0	2.14	206.5	0.005	3,056.27	3,055.87	3,050.35	3,050.34	5.00	5.67	3.90
CO-9	CB-308	3,048.21	CB-309	3,046.78	0.012	24 inch	24.0	12.83	286.5	0.005	3,055.87	3,055.86	3,049.50	3,048.06	5.66	7.08	6.03
CO-10	CB-313	3,049.43	CB-309	3,048.30	0.012	18 inch	18.0	3.73	212.7	0.005	3,055.93	3,055.86	3,050.17	3,049.01	5.00	6.06	4.57
CO-11	CB-309	3,045.78	CB-314	3,044.50	0.012	36 inch	36.0	19.42	256.0	0.005	3,055.86	3,055.87	3,047.20	3,047.30	7.08	8.37	6.73
CO-12	CB325	3,049.42	CB-314	3,048.33	0.012	18 inch	18.0	3.73	212.2	0.005	3,055.92	3,055.87	3,050.16	3,049.04	5.00	6.04	4.51
CO-13	CB-319	3,048.10	CB-314	3,046.70	0.012	18 inch	18.0	9.53	265.4	0.005	3,056.07	3,055.87	3,049.84	3,047.89	6.47	7.67	5.39
CO-14	CB-318	3,049.50	CB-319	3,048.40	0.012	18 inch	18.0	3.39	211.8	0.005	3,056.06	3,056.07	3,050.68	3,050.51	5.06	6.17	4.42
CO-15	CB-320	3,049.59	CB-319	3,048.40	0.012	18 inch	18.0	3.09	207.6	0.006	3,056.09	3,056.07	3,050.63	3,050.51	5.00	6.17	4.47
CO-16	CB-314	3,044.19	CB-326	3,043.00	0.012	36 inch	36.0	34.42	235.5	0.005	3,055.87	3,056.20	3,046.46	3,046.13	8.68	10.20	7.79
CO-17	MH-331	3,050.52	CB-326	3,050.44	0.012	12 inch	12.0	1.17	17.1	0.005	3,056.65	3,056.20	3,050.99	3,050.90	5.13	4.76	3.26
CO-19	CB-330	3,085.02	MH-331	3,050.82	0.012	12 inch	12.0	1.17	56.1	0.610	3,088.94	3,056.65	3,085.48	3,050.95	2.92	4.83	18.55
CO-20	CB-326	3,042.17	CB-332	3,041.10	0.012	36 inch	36.0	36.26	214.0	0.005	3,056.20	3,056.00	3,045.52	3,044.98	11.03	11.90	5.13
CO-21	CB-332	3,041.10	MH-333	3,040.73	0.012	36 inch	36.0	37.37	73.9	0.005	3,056.00	3,057.27	3,044.77	3,044.57	11.90	13.54	5.29
CO-22	MH-333	3,040.43	CB-335	3,039.84	0.012	36 inch	36.0	37.37	117.8	0.005	3,057.27	3,056.37	3,044.35	3,044.04	13.84	13.53	5.29
CO-23	CB-335	3,039.84	CB-336	3,038.98	0.012	36 inch	36.0	38.06	172.4	0.005	3,056.37	3,056.44	3,043.81	3,043.33	13.53	14.46	5.38
CO-24	CB-336	3,038.68	CB-337	3,038.02	0.012	42 inch	42.0	38.66	132.0	0.005	3,056.44	3,056.60	3,043.21	3,043.04	14.26	15.08	4.02
CO-25	CB-348	3,049.38	CB-349	3,048.30	0.012	18 inch	18.0	4.00	274.7	0.004	3,055.88	3,055.84	3,050.21	3,049.92	5.00	6.04	4.15
CO-26	CB-349	3,048.00	MH-350	3,046.74	0.012	18 inch	18.0	7.64	191.9	0.007	3,055.84	3,056.16	3,049.78	3,048.91	6.34	7.92	4.32
CO-29	CB-351	3,052.20	MH-350	3,052.00	0.012	18 inch	18.0	1.69	37.5	0.005	3,056.18	3,056.16	3,052.69	3,052.46	2.48	2.66	3.69
CO-30	MH-350	3,046.12	MH-354	3,044.96	0.012	18 inch	18.0	9.33	232.1	0.005	3,056.16	3,056.72	3,048.52	3,046.96	8.54	10.26	5.28
CO-31	CB-361	3,049.49	CB-362	3,048.63	0.012	18 inch	18.0	3.27	171.1	0.005	3,055.99	3,056.04	3,050.18	3,049.48	5.00	5.91	4.33
CO-32	CB-362	3,048.33	MH-354	3,047.66	0.012	18 inch	18.0	5.95	132.6	0.005	3,056.04	3,056.72	3,049.29	3,048.60	6.21	7.56	5.00
CO-33	CB-355	3,051.47	MH-354	3,051.28	0.012	18 inch	18.0	2.04	37.5	0.005	3,055.97	3,056.72	3,052.01	3,051.79	3.00	3.94	3.82
CO-34	MH-354	3,044.66	MH-363	3,043.38	0.012	24 inch	24.0	17.32	256.0	0.005	3,056.72	3,056.72	3,046.42	3,045.36	10.06	11.34	6.29
CO-35	CB-369	3,049.49	CB-370	3,048.64	0.012	18 inch	18.0	3.22	171.1	0.005	3,055.99	3,056.05	3,050.17	3,049.49	5.00	5.91	4.29
CO-37	CB-370	3,048.34	MH-363	3,047.68	0.012	18 inch	18.0	5.90	132.5	0.005	3,056.05	3,056.72	3,049.30	3,048.62	6.21	7.54	4.97
CO-38	CB-364	3,051.45	MH-363	3,051.20	0.012	18 inch	18.0	2.12	37.5	0.007	3,055.95	3,056.72	3,052.00	3,051.69	3.00	4.02	4.26
CO-39	MH-363	3,043.08	CB-337	3,041.20	0.012	36 inch	36.0	25.34	235.0	0.008	3,056.72	3,056.60	3,044.70	3,043.04	10.64	12.40	8.59
CO-40	CB-337	3,037.72	MH-371	3,037.64	0.012	42 inch	42.0	61.72	14.5	0.006	3,056.60	3,056.70	3,042.08	3,042.03	15.38	15.56	6.42
CO-41	MH-371	3,037.64	MH-372	3,037.55	0.012	42 inch	42.0	61.72	18.0	0.005	3,056.70	3,056.80	3,040.41	3,040.39	15.56	15.75	8.89
CO-42	MH-372	3,037.25	CB-373	3,009.48	0.012	42 inch	42.0	61.72	78.5	0.354	3,056.80	3,024.56	3,039.71	3,012.52	16.05	11.58	42.46
CO-43	CB-373	3,009.48	CB-374	2,985.80	0.012	42 inch	42.0	62.28	67.0	0.354	3,024.56	2,997.00	3,011.95	2,988.91	11.58	7.70	42.57
CO-44	CB-374	2,985.80	MH-376	2,962.04	0.012	42 inch	42.0	64.48	64.4	0.369	2,997.00	2,967.92	2,988.32	2,966.04	7.70	2.38	43.65
CO-45	MH-376	2,961.03	OF-378	2,959.80	0.013	48 inch	48.0	64.48	29.7	0.041	2,967.92	2,965.90	2,965.84	2,965.78	2.89	2.10	5.13

Scenario: 100-Year



FlexTable: Conduit Table (Rev Offsite Storm Drain.stc)

Label	Start Node	Invert (Upstream) (ft)	Stop Node	Invert (Downstream) (ft)	Manning's n	Section Size	Diameter (in)	Flow (ft³/s)	Length (Unified) (ft)	Slope (Calculated) (ft/ft)	Elevation Ground (Start) (ft)	Elevation Ground (Stop) (ft)	Hydraulic Grade Line (In) (ft)	Hydraulic Grade Line (Out) (ft)	Cover (Start) (ft)	Cover (Stop) (ft)	Velocity (Average) (ft/s)
CO-32	MH-119	3,047.02	MH-120	3,046.50	0.012	24 inch	24.0	17.52	103.2	0.005	3,057.64	3,057.34	3,048.68	3,048.17	8.62	8.84	6.31
CO-42	MH-120	3,046.20	MH-121	3,044.78	0.012	24 inch	24.0	17.52	284.6	0.005	3,057.34	3,057.64	3,047.86	3,046.44	9.14	10.86	6.28
CO-45	MH-121	3,044.48	MH-111	3,043.00	0.012	24 inch	24.0	17.52	294.5	0.005	3,057.64	3,057.50	3,046.14	3,044.65	11.16	12.50	6.30
CO-50	MH-111	3,041.50	MH-122	3,040.33	0.012	42 inch	42.0	58.31	235.0	0.005	3,057.50	3,057.41	3,043.89	3,043.07	12.50	13.58	8.79
CO-53.1	MH-122	3,040.03	CB-124	2,998.01	0.012	42 inch	42.0	58.31	155.7	0.270	3,057.41	3,024.68	3,042.42	3,000.94	13.88	23.17	37.96
CO-53.2	CB-124	2,998.01	CB-126	2,978.32	0.012	42 inch	42.0	58.31	73.0	0.270	3,024.68	2,990.78	3,000.40	2,981.25	23.17	8.96	37.96
CO-53.3	CB-126	2,978.32	MH-128	2,962.19	0.012	42 inch	42.0	58.31	63.8	0.253	2,990.78	2,970.00	2,980.71	2,965.05	8.96	4.31	37.09
CO-72	MH-128	2,962.12	OF-130	2,961.93	0.013	42 inch	42.0	58.31	19.0	0.010	2,970.00	2,960.19	2,964.51	2,964.06	4.38	-5.24	10.83
CO-2 & 3	CB-105	3,142.71	CB-104	3,140.48	0.012	18 inch	18.0	0.79	223.5	0.010	3,151.00	3,146.24	3,143.04	3,141.66	6.79	4.26	3.70
CO-4, 5, 6 & 7	CB-104	3,140.33	CB-106	3,127.96	0.012	18 inch	18.0	7.73	276.0	0.045	3,146.24	3,135.38	3,141.41	3,129.63	4.41	5.92	12.14
CO-8-15	CB-106	3,127.66	CB-107	3,108.92	0.012	18 inch	18.0	14.75	449.4	0.042	3,135.38	3,114.38	3,129.06	3,109.79	6.22	3.96	13.92
CO-22	CB-107	3,107.98	CB-108	3,091.29	0.012	24 inch	24.0	24.48	292.0	0.057	3,114.38	3,098.87	3,109.73	3,093.79	4.40	5.58	17.81
CO-23	CB-108	3,090.99	CB-109	3,075.41	0.012	24 inch	24.0	33.07	295.5	0.053	3,098.87	3,082.68	3,092.89	3,080.66	5.88	5.27	18.63
CO-25	CB-118	3,048.38	MH-119	3,047.32	0.012	24 inch	24.0	17.52	95.4	0.011	3,058.23	3,057.64	3,049.89	3,049.05	7.85	8.32	8.84
CO-26	CB-109	3,075.11	CB-110	3,059.45	0.012	24 inch	24.0	38.76	30.3	0.516	3,082.68	3,073.27	3,077.06	3,061.90	5.57	11.82	44.96
CO-28	CB-110	3,059.45	CB-110.5	3,050.09	0.012	24 inch	24.0	40.45	21.0	0.445	3,073.27	3,060.00	3,061.40	3,052.55	11.82	7.91	43.13
CO-29	CB-110.5	3,050.09	MH-111	3,045.00	0.012	24 inch	24.0	40.79	12.1	0.422	3,060.00	3,057.50	3,052.05	3,046.11	7.91	10.50	42.43

Culvert Calculator Report
SD01-Public (12+59.60)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,228.24	ft	Headwater Depth/Height	1.24	
Computed Headwater Elev	3,228.23	ft	Discharge	16.32	cfs
Inlet Control HW Elev.	3,228.09	ft	Tailwater Elevation	3,222.44	ft
Outlet Control HW Elev.	3,228.23	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,225.74	ft	Downstream Invert	3,221.94	ft
Length	56.43	ft	Constructed Slope	0.067340	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.76	ft
Slope Type	Steep		Normal Depth	0.69	ft
Flow Regime	Supercritical		Critical Depth	1.46	ft
Velocity Downstream	14.95	ft/s	Critical Slope	0.005721	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	3,228.23	ft	Upstream Velocity Head	0.69	ft
Ke	0.50		Entrance Loss	0.34	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,228.09	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD01 (31+32.45)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,146.53	ft	Headwater Depth/Height	1.21	
Computed Headwater Elev	3,146.14	ft	Discharge	15.58	cfs
Inlet Control HW Elev.	3,145.99	ft	Tailwater Elevation	3,141.28	ft
Outlet Control HW Elev.	3,146.14	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,143.73	ft	Downstream Invert	3,140.78	ft
Length	44.92	ft	Constructed Slope	0.065672	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.77	ft
Slope Type	Steep		Normal Depth	0.68	ft
Flow Regime	Supercritical		Critical Depth	1.42	ft
Velocity Downstream	14.06	ft/s	Critical Slope	0.005527	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	3,146.14	ft	Upstream Velocity Head	0.66	ft
Ke	0.50		Entrance Loss	0.33	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,145.99	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD02-Public (17+60)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,189.36	ft	Headwater Depth/Height	1.12	
Computed Headwater Elev	3,189.36	ft	Discharge	24.40	cfs
Inlet Control HW Elev.	3,189.21	ft	Tailwater Elevation	3,186.59	ft
Outlet Control HW Elev.	3,189.36	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,186.55	ft	Downstream Invert	3,186.09	ft
Length	35.73	ft	Constructed Slope	0.012874	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.35	ft
Slope Type	Steep		Normal Depth	1.23	ft
Flow Regime	Supercritical		Critical Depth	1.68	ft
Velocity Downstream	9.02	ft/s	Critical Slope	0.004777	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,189.36	ft	Upstream Velocity Head	0.75	ft
Ke	0.50		Entrance Loss	0.37	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,189.21	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD02 (33+37.23)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,148.91	ft	Headwater Depth/Height	0.69	
Computed Headwater Elev	3,146.97	ft	Discharge	3.01	cfs
Inlet Control HW Elev.	3,146.81	ft	Tailwater Elevation	3,143.25	ft
Outlet Control HW Elev.	3,146.97	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,145.93	ft	Downstream Invert	3,142.75	ft
Length	43.34	ft	Constructed Slope	0.073373	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.32	ft
Slope Type	Steep		Normal Depth	0.32	ft
Flow Regime	Supercritical		Critical Depth	0.66	ft
Velocity Downstream	10.91	ft/s	Critical Slope	0.004369	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,146.97	ft	Upstream Velocity Head	0.25	ft
Ke	0.50		Entrance Loss	0.13	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,146.81	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD03 (38+01.54)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,125.58	ft	Headwater Depth/Height	1.48	
Computed Headwater Elev	3,125.46	ft	Discharge	36.14	cfs
Inlet Control HW Elev.	3,125.46	ft	Tailwater Elevation	3,122.25	ft
Outlet Control HW Elev.	3,125.45	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,121.75	ft	Downstream Invert	3,117.30	ft
Length	45.50	ft	Constructed Slope	0.097802	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	1.06	ft
Slope Type	N/A		Normal Depth	0.87	ft
Flow Regime	N/A		Critical Depth	2.04	ft
Velocity Downstream	18.30	ft/s	Critical Slope	0.006676	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	2.50 ft
Section Size	30 inch	Rise	2.50 ft
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	3,125.45	ft	Upstream Velocity Head	1.10	ft
Ke	0.50		Entrance Loss	0.55	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,125.46	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD04 (40+34.69)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,125.10	ft	Headwater Depth/Height	1.58	
Computed Headwater Elev	3,124.19	ft	Discharge	42.77	cfs
Inlet Control HW Elev.	3,124.19	ft	Tailwater Elevation	3,120.63	ft
Outlet Control HW Elev.	3,124.06	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,121.03	ft	Downstream Invert	3,120.13	ft
Length	44.94	ft	Constructed Slope	0.020027	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.25	ft
Slope Type	Steep		Normal Depth	1.14	ft
Flow Regime	Supercritical		Critical Depth	1.66	ft
Velocity Downstream	10.39	ft/s	Critical Slope	0.007488	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	3,124.06	ft	Upstream Velocity Head	0.92	ft
Ke	0.50		Entrance Loss	0.46	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,124.19	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	6.3	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD05

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,076.90	ft	Headwater Depth/Height	1.63	
Computed Headwater Elev	3,076.90	ft	Discharge	10.82	cfs
Inlet Control HW Elev.	3,076.90	ft	Tailwater Elevation	3,073.92	ft
Outlet Control HW Elev.	3,076.80	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,074.45	ft	Downstream Invert	3,071.92	ft
Length	38.05	ft	Constructed Slope	0.066491	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	0.71	ft
Slope Type	N/A		Normal Depth	0.63	ft
Flow Regime	N/A		Critical Depth	1.26	ft
Velocity Downstream	13.16	ft/s	Critical Slope	0.008656	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,076.80	ft	Upstream Velocity Head	0.72	ft
Ke	0.50		Entrance Loss	0.36	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,076.90	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD06 (56+21.82)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,055.82	ft	Headwater Depth/Height	1.40	
Computed Headwater Elev	3,055.54	ft	Discharge	33.67	cfs
Inlet Control HW Elev.	3,055.49	ft	Tailwater Elevation	3,048.80	ft
Outlet Control HW Elev.	3,055.54	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,052.04	ft	Downstream Invert	3,048.30	ft
Length	47.80	ft	Constructed Slope	0.078243	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.06	ft
Slope Type	Steep		Normal Depth	0.89	ft
Flow Regime	Supercritical		Critical Depth	1.97	ft
Velocity Downstream	16.93	ft/s	Critical Slope	0.006171	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,055.54	ft	Upstream Velocity Head	1.02	ft
Ke	0.50		Entrance Loss	0.51	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,055.49	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD07 (59+66.37)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,078.66	ft	Headwater Depth/Height	1.46	
Computed Headwater Elev	3,078.17	ft	Discharge	9.94	cfs
Inlet Control HW Elev.	3,078.16	ft	Tailwater Elevation	3,072.10	ft
Outlet Control HW Elev.	3,078.17	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,075.98	ft	Downstream Invert	3,071.60	ft
Length	40.30	ft	Constructed Slope	0.108685	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.58	ft
Slope Type	Steep		Normal Depth	0.53	ft
Flow Regime	Supercritical		Critical Depth	1.22	ft
Velocity Downstream	15.65	ft/s	Critical Slope	0.007789	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,078.17	ft	Upstream Velocity Head	0.65	ft
Ke	0.50		Entrance Loss	0.33	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,078.16	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD08 (70+82.70)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,071.37	ft	Headwater Depth/Height	1.16	
Computed Headwater Elev	3,070.13	ft	Discharge	14.71	cfs
Inlet Control HW Elev.	3,070.00	ft	Tailwater Elevation	3,067.06	ft
Outlet Control HW Elev.	3,070.13	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,067.81	ft	Downstream Invert	3,066.56	ft
Length	38.54	ft	Constructed Slope	0.032434	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.90	ft
Slope Type	Steep		Normal Depth	0.80	ft
Flow Regime	Supercritical		Critical Depth	1.38	ft
Velocity Downstream	10.74	ft/s	Critical Slope	0.005315	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,070.13	ft	Upstream Velocity Head	0.63	ft
Ke	0.50		Entrance Loss	0.31	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,070.00	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD09 (73+01.11)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,067.18	ft	Headwater Depth/Height	1.29	
Computed Headwater Elev	3,066.86	ft	Discharge	139.02	cfs
Inlet Control HW Elev.	3,066.69	ft	Tailwater Elevation	3,061.57	ft
Outlet Control HW Elev.	3,066.86	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,062.35	ft	Downstream Invert	3,060.21	ft
Length	42.00	ft	Constructed Slope	0.050952	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.65	ft
Slope Type	Steep		Normal Depth	1.27	ft
Flow Regime	Supercritical		Critical Depth	2.61	ft
Velocity Downstream	15.63	ft/s	Critical Slope	0.004944	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	3.50 ft
Section Size	42 inch	Rise	3.50 ft
Number Sections	2		

Outlet Control Properties					
Outlet Control HW Elev.	3,066.86	ft	Upstream Velocity Head	1.27	ft
Ke	0.50		Entrance Loss	0.63	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,066.69	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	19.2	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD10 (79+71.02)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,094.50	ft	Headwater Depth/Height	0.45	
Computed Headwater Elev	3,091.98	ft	Discharge	1.38	cfs
Inlet Control HW Elev.	3,091.87	ft	Tailwater Elevation	309.45	ft
Outlet Control HW Elev.	3,091.98	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,091.30	ft	Downstream Invert	3,088.95	ft
Length	44.90	ft	Constructed Slope	0.052339	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.23	ft
Slope Type	Steep		Normal Depth	0.23	ft
Flow Regime	Supercritical		Critical Depth	0.44	ft
Velocity Downstream	7.81	ft/s	Critical Slope	0.004180	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,091.98	ft	Upstream Velocity Head	0.16	ft
Ke	0.50		Entrance Loss	0.08	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,091.87	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD11 (83+06.52)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,084.33	ft	Headwater Depth/Height	1.23	
Computed Headwater Elev	3,083.23	ft	Discharge	16.02	cfs
Inlet Control HW Elev.	3,083.11	ft	Tailwater Elevation	3,079.68	ft
Outlet Control HW Elev.	3,083.23	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,080.77	ft	Downstream Invert	3,079.18	ft
Length	41.00	ft	Constructed Slope	0.038780	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.90	ft
Slope Type	Steep		Normal Depth	0.79	ft
Flow Regime	Supercritical		Critical Depth	1.44	ft
Velocity Downstream	11.66	ft/s	Critical Slope	0.005641	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	3,083.23	ft	Upstream Velocity Head	0.68	ft
Ke	0.50		Entrance Loss	0.34	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,083.11	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD12 (86+18.61)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,067.78	ft	Headwater Depth/Height	1.77	
Computed Headwater Elev	3,067.78	ft	Discharge	23.58	cfs
Inlet Control HW Elev.	3,067.78	ft	Tailwater Elevation	3,061.67	ft
Outlet Control HW Elev.	3,067.54	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,064.25	ft	Downstream Invert	3,061.17	ft
Length	60.40	ft	Constructed Slope	0.050993	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.02	ft
Slope Type	Steep		Normal Depth	0.91	ft
Flow Regime	Supercritical		Critical Depth	1.72	ft
Velocity Downstream	14.71	ft/s	Critical Slope	0.008551	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	2.00	ft
Section Size	24 inch		Rise	2.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,067.54	ft	Upstream Velocity Head	1.04	ft
Ke	0.50		Entrance Loss	0.52	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,067.78	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD13 (89+63.56)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,055.89	ft	Headwater Depth/Height	1.66	
Computed Headwater Elev	3,055.43	ft	Discharge	11.04	cfs
Inlet Control HW Elev.	3,055.43	ft	Tailwater Elevation	3,051.33	ft
Outlet Control HW Elev.	3,055.32	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,052.94	ft	Downstream Invert	3,049.13	ft
Length	45.00	ft	Constructed Slope	0.084667	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	0.66	ft
Slope Type	N/A		Normal Depth	0.60	ft
Flow Regime	N/A		Critical Depth	1.27	ft
Velocity Downstream	14.85	ft/s	Critical Slope	0.008895	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,055.32	ft	Upstream Velocity Head	0.74	ft
Ke	0.50		Entrance Loss	0.37	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,055.43	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD14 (95+06.72)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,073.91	ft	Headwater Depth/Height	1.57	
Computed Headwater Elev	3,073.67	ft	Discharge	21.39	cfs
Inlet Control HW Elev.	3,073.67	ft	Tailwater Elevation	3,068.73	ft
Outlet Control HW Elev.	3,073.58	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,070.54	ft	Downstream Invert	3,068.23	ft
Length	43.70	ft	Constructed Slope	0.052860	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.99	ft
Slope Type	Steep		Normal Depth	0.85	ft
Flow Regime	Supercritical		Critical Depth	1.66	ft
Velocity Downstream	13.79	ft/s	Critical Slope	0.007490	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	3,073.58	ft	Upstream Velocity Head	0.92	ft
Ke	0.50		Entrance Loss	0.46	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,073.67	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	3.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD15 (101+17.00)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,083.96	ft	Headwater Depth/Height	0.88	
Computed Headwater Elev	3,082.39	ft	Discharge	4.54	cfs
Inlet Control HW Elev.	3,082.26	ft	Tailwater Elevation	3,079.60	ft
Outlet Control HW Elev.	3,082.39	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,081.08	ft	Downstream Invert	3,079.10	ft
Length	40.10	ft	Constructed Slope	0.049377	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.45	ft
Slope Type	Steep		Normal Depth	0.43	ft
Flow Regime	Supercritical		Critical Depth	0.82	ft
Velocity Downstream	10.13	ft/s	Critical Slope	0.004771	ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.012
Section Material	HDPE (Smooth Interior)	Span	1.50 ft
Section Size	18 inch	Rise	1.50 ft
Number Sections	1		

Outlet Control Properties					
Outlet Control HW Elev.	3,082.39	ft	Upstream Velocity Head	0.33	ft
Ke	0.50		Entrance Loss	0.16	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,082.26	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD16 (103+20.95)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,082.06	ft	Headwater Depth/Height	0.68	
Computed Headwater Elev	3,080.22	ft	Discharge	2.92	cfs
Inlet Control HW Elev.	3,080.09	ft	Tailwater Elevation	3,076.98	ft
Outlet Control HW Elev.	3,080.22	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,079.20	ft	Downstream Invert	3,077.00	ft
Length	43.97	ft	Constructed Slope	0.050034	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.35	ft
Slope Type	Steep		Normal Depth	0.34	ft
Flow Regime	Supercritical		Critical Depth	0.65	ft
Velocity Downstream	9.41	ft/s	Critical Slope	0.004361	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,080.22	ft	Upstream Velocity Head	0.25	ft
Ke	0.50		Entrance Loss	0.12	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,080.09	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD17 (107+36.02)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,069.12	ft	Headwater Depth/Height	1.15	
Computed Headwater Elev	3,068.20	ft	Discharge	25.27	cfs
Inlet Control HW Elev.	3,068.01	ft	Tailwater Elevation	3,063.75	ft
Outlet Control HW Elev.	3,068.20	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,065.33	ft	Downstream Invert	3,062.81	ft
Length	46.70	ft	Constructed Slope	0.053961	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.98	ft
Slope Type	Steep		Normal Depth	0.84	ft
Flow Regime	Supercritical		Critical Depth	1.71	ft
Velocity Downstream	14.13	ft/s	Critical Slope	0.004882	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,068.20	ft	Upstream Velocity Head	0.77	ft
Ke	0.50		Entrance Loss	0.39	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,068.01	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Culvert Calculator Report
SD20 (123+23.61)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,083.14	ft	Headwater Depth/Height	3.02	
Computed Headwater Elev	3,083.13	ft	Discharge	16.88	cfs
Inlet Control HW Elev.	3,083.13	ft	Tailwater Elevation	3,071.80	ft
Outlet Control HW Elev.	3,082.23	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	3,078.60	ft	Downstream Invert	3,071.30	ft
Length	52.64	ft	Constructed Slope	0.138678	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.73	ft
Slope Type	Steep		Normal Depth	0.66	ft
Flow Regime	Supercritical		Critical Depth	1.44	ft
Velocity Downstream	19.90	ft/s	Critical Slope	0.019150	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	HDPE (Smooth Interior)		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,082.23	ft	Upstream Velocity Head	1.46	ft
Ke	0.50		Entrance Loss	0.73	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,083.13	ft	Flow Control	N/A	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

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BASIN 100

RUN DATE 11/9/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 10 MIN.
6 HOUR RAINFALL 3.6 INCHES
BASIN AREA 22.5 ACRES
RUNOFF COEFFICIENT 0.52
PEAK DISCHARGE 71.27 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 2.5
TIME (MIN) = 20	DISCHARGE (CFS) = 2.6
TIME (MIN) = 30	DISCHARGE (CFS) = 2.7
TIME (MIN) = 40	DISCHARGE (CFS) = 2.7
TIME (MIN) = 50	DISCHARGE (CFS) = 2.8
TIME (MIN) = 60	DISCHARGE (CFS) = 2.9
TIME (MIN) = 70	DISCHARGE (CFS) = 3
TIME (MIN) = 80	DISCHARGE (CFS) = 3.1
TIME (MIN) = 90	DISCHARGE (CFS) = 3.3
TIME (MIN) = 100	DISCHARGE (CFS) = 3.4
TIME (MIN) = 110	DISCHARGE (CFS) = 3.6
TIME (MIN) = 120	DISCHARGE (CFS) = 3.7
TIME (MIN) = 130	DISCHARGE (CFS) = 4
TIME (MIN) = 140	DISCHARGE (CFS) = 4.1
TIME (MIN) = 150	DISCHARGE (CFS) = 4.5
TIME (MIN) = 160	DISCHARGE (CFS) = 4.7
TIME (MIN) = 170	DISCHARGE (CFS) = 5.2
TIME (MIN) = 180	DISCHARGE (CFS) = 5.5
TIME (MIN) = 190	DISCHARGE (CFS) = 6.3
TIME (MIN) = 200	DISCHARGE (CFS) = 6.9
TIME (MIN) = 210	DISCHARGE (CFS) = 8.4
TIME (MIN) = 220	DISCHARGE (CFS) = 9.6
TIME (MIN) = 230	DISCHARGE (CFS) = 14.1
TIME (MIN) = 240	DISCHARGE (CFS) = 19.5
TIME (MIN) = 250	DISCHARGE (CFS) = 71.27
TIME (MIN) = 260	DISCHARGE (CFS) = 11.3
TIME (MIN) = 270	DISCHARGE (CFS) = 7.5
TIME (MIN) = 280	DISCHARGE (CFS) = 5.9
TIME (MIN) = 290	DISCHARGE (CFS) = 4.9
TIME (MIN) = 300	DISCHARGE (CFS) = 4.3
TIME (MIN) = 310	DISCHARGE (CFS) = 3.8
TIME (MIN) = 320	DISCHARGE (CFS) = 3.5
TIME (MIN) = 330	DISCHARGE (CFS) = 3.2
TIME (MIN) = 340	DISCHARGE (CFS) = 3
TIME (MIN) = 350	DISCHARGE (CFS) = 2.8
TIME (MIN) = 360	DISCHARGE (CFS) = 2.6
TIME (MIN) = 370	DISCHARGE (CFS) = 0

DETENTION BASIN 100

5x4 (Top of Pipe Elev.: 3015.5')								
	Perforations		Top of Riser					
Elevation (ft)	Delta Elevation (ft)	Q (cfs)	Delta Elevation (ft)	H/R	Cscw	Q_{weir} (cfs)	$Q_{orifice}$ (cfs)	Q (cfs) 50% Debris Blockage
3010	0.0	0.00	-5.5	N/A	N/A	0.00	0.00	0.00
3010.5	0.5	0.67	-5.0	N/A	N/A	0.00	0.00	0.33
3011	1.0	0.95	-4.5	N/A	N/A	0.00	0.00	0.47
3011.5	1.5	1.16	-4.0	N/A	N/A	0.00	0.00	0.58
3012	2.0	2.01	-3.5	N/A	N/A	0.00	0.00	1.00
3012.5	2.5	2.44	-3.0	N/A	N/A	0.00	0.00	1.22
3013	3.0	3.46	-2.5	N/A	N/A	0.00	0.00	1.73
3013.5	3.5	4.05	-2.0	N/A	N/A	0.00	0.00	2.03
3014	4.0	4.54	-1.5	N/A	N/A	0.00	0.00	2.27
3014.5	4.5	4.98	-1.0	N/A	N/A	0.00	0.00	2.49
3015	5.0	5.38	-0.5	N/A	N/A	0.00	0.00	2.69
3015.5	5.5	5.75	0.0	N/A	N/A	0.00	0.00	2.87
3016	6.0	6.09	0.5	N/A	3.31	21.04	68.09	13.57
3016.5	6.5	6.42	1.0	N/A	3.34	60.17	96.30	33.29
3017	7.0	6.72	1.5	N/A	3.38	111.74	117.94	59.23
3017.5	7.5	7.02	2.0	N/A	3.42	173.89	136.19	71.60
3018	8.0	7.30	2.5	N/A	3.45	245.60	152.26	79.78

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
100-YEAR	HYG	100	3.487		4.1667	71.27		
DET.BASIN 100IN	POND	100	3.487		4.1700	70.07		
DET.BASIN 100OUT	POND	100	3.221	R	4.3100	18.20	3016.12	2.340
*OUT 20	JCT	100	3.221	R	4.3100	18.20		

Culvert Calculator Report
Basin 100

Solve For: Headwater Elevation

3006.15 < 3016.12'
OK ✓

Culvert Summary					
Allowable HW Elevation	3,016.12	ft	Headwater Depth/Height	0.72	
Computed Headwater Elev	3,006.15	ft	Discharge	18.20	cfs
Inlet Control HW Elev.	3,005.95	ft	Tailwater Elevation	3,004.31	ft
Outlet Control HW Elev.	3,006.15	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	3,004.00	ft	Downstream Invert	3,002.81	ft
Length	237.84	ft	Constructed Slope	0.005003	ft/ft

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	1.50	ft
Slope Type	Steep		Normal Depth	1.24	ft
Flow Regime	N/A		Critical Depth	1.37	ft
Velocity Downstream	5.15	ft/s	Critical Slope	0.003505	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,006.15	ft	Upstream Velocity Head	0.52	ft
Ke	0.50		Entrance Loss	0.26	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,005.95	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	7.1	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

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BASIN 200

RUN DATE 11/10/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 12 MIN.
6 HOUR RAINFALL 3.6 INCHES
BASIN AREA 2.7 ACRES
RUNOFF COEFFICIENT 0.44
PEAK DISCHARGE 6.37 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 12	DISCHARGE (CFS) = 0.3
TIME (MIN) = 24	DISCHARGE (CFS) = 0.3
TIME (MIN) = 36	DISCHARGE (CFS) = 0.3
TIME (MIN) = 48	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 72	DISCHARGE (CFS) = 0.3
TIME (MIN) = 84	DISCHARGE (CFS) = 0.3
TIME (MIN) = 96	DISCHARGE (CFS) = 0.3
TIME (MIN) = 108	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 132	DISCHARGE (CFS) = 0.4
TIME (MIN) = 144	DISCHARGE (CFS) = 0.4
TIME (MIN) = 156	DISCHARGE (CFS) = 0.5
TIME (MIN) = 168	DISCHARGE (CFS) = 0.5
TIME (MIN) = 180	DISCHARGE (CFS) = 0.6
TIME (MIN) = 192	DISCHARGE (CFS) = 0.6
TIME (MIN) = 204	DISCHARGE (CFS) = 0.8
TIME (MIN) = 216	DISCHARGE (CFS) = 0.9
TIME (MIN) = 228	DISCHARGE (CFS) = 1.3
TIME (MIN) = 240	DISCHARGE (CFS) = 1.8
TIME (MIN) = 252	DISCHARGE (CFS) = 6.37
TIME (MIN) = 264	DISCHARGE (CFS) = 1
TIME (MIN) = 276	DISCHARGE (CFS) = 0.7
TIME (MIN) = 288	DISCHARGE (CFS) = 0.5
TIME (MIN) = 300	DISCHARGE (CFS) = 0.4
TIME (MIN) = 312	DISCHARGE (CFS) = 0.4
TIME (MIN) = 324	DISCHARGE (CFS) = 0.3
TIME (MIN) = 336	DISCHARGE (CFS) = 0.3
TIME (MIN) = 348	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 372	DISCHARGE (CFS) = 0

DETENTION BASIN 200							
24" Riser (Top of Pipe Elev.: 3048.40')							
	Perforations		Top of Riser				
Elevation (ft)	Delta Elevation (ft)	Q (cfs)	Delta Elevation (ft)	H/R	Q_{weir} (cfs)	$Q_{orifice}$ (cfs)	Q (cfs) 50% Debris Blockage
3042.9	0.0	0.00	-5.5	0.00	0.00	0.00	0.00
3043.4	0.5	0.07	-5.0	0.00	0.00	0.00	0.04
3043.9	1.0	0.11	-4.5	0.00	0.00	0.00	0.05
3044.4	1.5	0.13	-4.0	0.00	0.00	0.00	0.06
3044.9	2.0	0.15	-3.5	0.00	0.00	0.00	0.07
3045.4	2.5	0.17	-3.0	0.00	0.00	0.00	0.08
3045.9	3.0	0.85	-2.5	0.00	0.00	0.00	0.43
3046.4	3.5	1.14	-2.0	0.00	0.00	0.00	0.57
3046.9	4.0	1.37	-1.5	0.00	0.00	0.00	0.68
3047.4	4.5	1.56	-1.0	0.00	0.00	0.00	0.78
3047.9	5.0	1.73	-0.5	0.00	0.00	0.00	0.86
3048.4	5.5	1.88	0.0	0.00	0.00	0.00	0.94
3048.9	6.0	2.03	0.5	0.50	7.44	10.70	4.73
3049.4	6.5	2.16	1.0	1.00	12.75	15.13	7.46
3049.9	7.0	2.28	1.5	1.50	15.81	18.53	9.05
3050.4	7.5	2.40	2.0	2.00	17.77	21.39	10.09

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
100-YEAR	HYG	100	.357		4.2000	6.37		
DET.BASIN 200IN	POND	100	.357		4.2000	6.37		
DET.BASIN 200OUT	POND	100	.356		4.3800	.94	3048.39	.204
*OUT 20	JCT	100	.356		4.3800	.94		

Culvert Calculator Report
Basin 200

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	3,048.39	ft	Headwater Depth/Height	0.37	
Computed Headwater Elev	3,038.53	ft	Discharge	0.94	cfs
Inlet Control HW Elev.	3,038.47	ft	Tailwater Elevation	3,038.34	ft
Outlet Control HW Elev.	3,038.53	ft	Control Type	Entrance Control	

3038.53 < 3048.39 ✓
OK ✓

Grades					
Upstream Invert	3,037.98	ft	Downstream Invert	3,037.59	ft
Length	59.82	ft	Constructed Slope	0.006520	ft/ft

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	0.75	ft
Slope Type	Steep		Normal Depth	0.32	ft
Flow Regime	N/A		Critical Depth	0.36	ft
Velocity Downstream	1.06	ft/s	Critical Slope	0.004216	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Concrete		Span	1.50	ft
Section Size	18 inch		Rise	1.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	3,038.53	ft	Upstream Velocity Head	0.13	ft
Ke	0.50		Entrance Loss	0.06	ft

Inlet Control Properties					
Inlet Control HW Elev.	3,038.47	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	1.8	ft²
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

RATIONAL METHOD HYDROGRAPH PROGRAM

BASIN 300

RUN DATE 11/11/2009
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 15 MIN.
6 HOUR RAINFALL 3.6 INCHES
BASIN AREA 30 ACRES
RUNOFF COEFFICIENT 0.48
PEAK DISCHARGE 68.41 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 15	DISCHARGE (CFS) = 3.1
TIME (MIN) = 30	DISCHARGE (CFS) = 3.2
TIME (MIN) = 45	DISCHARGE (CFS) = 3.4
TIME (MIN) = 60	DISCHARGE (CFS) = 3.5
TIME (MIN) = 75	DISCHARGE (CFS) = 3.8
TIME (MIN) = 90	DISCHARGE (CFS) = 3.9
TIME (MIN) = 105	DISCHARGE (CFS) = 4.3
TIME (MIN) = 120	DISCHARGE (CFS) = 4.5
TIME (MIN) = 135	DISCHARGE (CFS) = 4.9
TIME (MIN) = 150	DISCHARGE (CFS) = 5.2
TIME (MIN) = 165	DISCHARGE (CFS) = 6
TIME (MIN) = 180	DISCHARGE (CFS) = 6.5
TIME (MIN) = 195	DISCHARGE (CFS) = 8
TIME (MIN) = 210	DISCHARGE (CFS) = 9.1
TIME (MIN) = 225	DISCHARGE (CFS) = 13.3
TIME (MIN) = 240	DISCHARGE (CFS) = 17.6
TIME (MIN) = 255	DISCHARGE (CFS) = 68.41
TIME (MIN) = 270	DISCHARGE (CFS) = 10.7
TIME (MIN) = 285	DISCHARGE (CFS) = 7.1
TIME (MIN) = 300	DISCHARGE (CFS) = 5.6
TIME (MIN) = 315	DISCHARGE (CFS) = 4.7
TIME (MIN) = 330	DISCHARGE (CFS) = 4.1
TIME (MIN) = 345	DISCHARGE (CFS) = 3.6
TIME (MIN) = 360	DISCHARGE (CFS) = 3.3
TIME (MIN) = 375	DISCHARGE (CFS) = 0

DETENTION BASIN 300

5'x4' (Top of Pipe Elev.: 2964.5')								
	Perforations		Top of Riser					
Elevation (ft)	Delta Elevation (ft)	Q (cfs)	Delta Elevation (ft)	H/R	Cscw	Q_{weir} (cfs)	$Q_{orifice}$ (cfs)	Q (cfs) 50% Debris Blockage
2959	0.0	0.00	-5.5	N/A	N/A	0.00	0.00	0.00
2959.5	0.5	0.67	-5.0	N/A	N/A	0.00	0.00	0.33
2960	1.0	0.95	-4.5	N/A	N/A	0.00	0.00	0.47
2960.5	1.5	1.16	-4.0	N/A	N/A	0.00	0.00	0.58
2961	2.0	2.01	-3.5	N/A	N/A	0.00	0.00	1.00
2961.5	2.5	2.44	-3.0	N/A	N/A	0.00	0.00	1.22
2962	3.0	3.46	-2.5	N/A	N/A	0.00	0.00	1.73
2962.5	3.5	4.05	-2.0	N/A	N/A	0.00	0.00	2.03
2963	4.0	4.54	-1.5	N/A	N/A	0.00	0.00	2.27
2963.5	4.5	4.98	-1.0	N/A	N/A	0.00	0.00	2.49
2964	5.0	5.38	-0.5	N/A	N/A	0.00	0.00	2.69
2964.5	5.5	5.75	0.0	N/A	3.27	0.00	0.00	2.87
2965	6.0	6.09	0.5	N/A	3.31	21.04	68.09	13.57
2965.5	6.5	6.42	1.0	N/A	3.34	60.17	96.30	33.29
2966	7.0	6.72	1.5	N/A	3.38	111.74	117.94	59.23
2966.5	7.5	7.02	2.0	N/A	3.42	173.89	136.19	71.60
2967	8.0	7.30	2.5	N/A	3.45	245.60	152.26	79.78
2967.5	8.5	7.57	3.0	N/A	3.49	326.25	166.80	87.18
2968	9.0	7.84	3.5	N/A	3.52	415.41	180.16	94.00

MASTER DESIGN STORM SUMMARY

Hydrograph Queue Only Network

MASTER NETWORK SUMMARY
SCS Unit Hydrograph Method
Hydrograph File Import Option Used For 1 node(s)

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
100-YEAR	HYG	100	4.294		4.2500	68.41		
DET.BASIN 300IN	POND	100	4.294		4.2500	68.41		
DET.BASIN 300OUT	POND	100	4.293		4.3500	47.66	2965.78	2.226
*OUT 20	JCT	100	4.293		4.3500	47.66		

Culvert Calculator Report
Basin 300

Solve For: Headwater Elevation

Culvert Summary				
Allowable HW Elevation	2,965.78 ft	Headwater Depth/Height	1.30	
Computed Headwater Elev	2,957.12 ft	Discharge	47.66	cfs
Inlet Control HW Elev.	2,956.58 ft	Tailwater Elevation	2,891.59	ft
Outlet Control HW Elev.	2,957.12 ft	Control Type	Entrance Control	

2957.12 < 2965.78
OK ✓

Grades				
Upstream Invert	2,953.23 ft	Downstream Invert	2,890.09	ft
Length	199.60 ft	Constructed Slope	0.316333	ft/ft

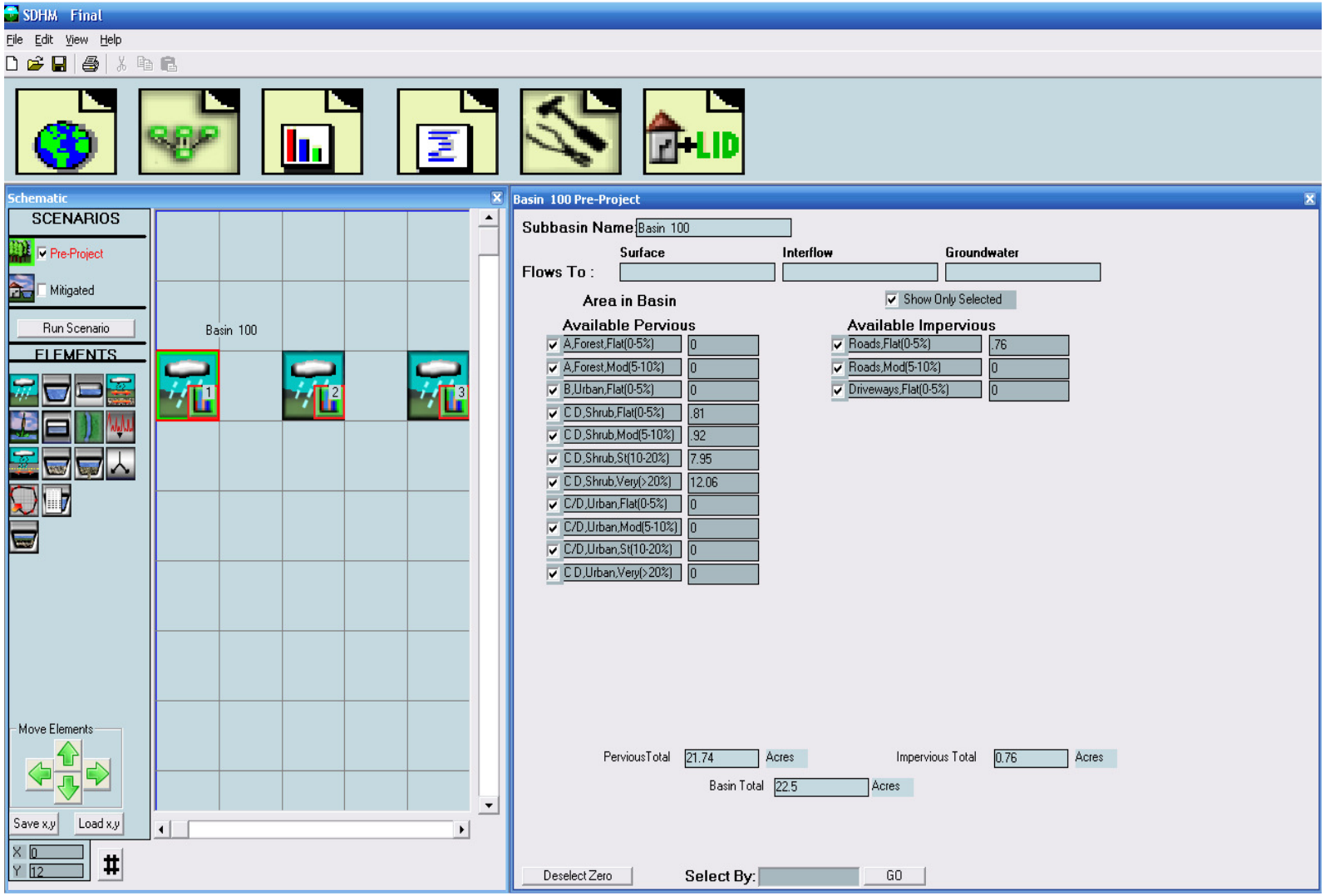
Hydraulic Profile				
Profile	S2	Depth, Downstream	0.69	ft
Slope Type	Steep	Normal Depth	0.69	ft
Flow Regime	Supercritical	Critical Depth	2.25	ft
Velocity Downstream	38.51 ft/s	Critical Slope	0.005239	ft/ft

Section				
Section Shape	Circular	Mannings Coefficient	0.012	
Section Material	Concrete	Span	3.00	ft
Section Size	36 inch	Rise	3.00	ft
Number Sections	1			

Outlet Control Properties				
Outlet Control HW Elev.	2,957.12 ft	Upstream Velocity Head	1.09	ft
Ke	0.50	Entrance Loss	0.55	ft

Inlet Control Properties				
Inlet Control HW Elev.	2,956.58 ft	Flow Control	Transition	
Inlet Type	Square edge w/headwall	Area Full	7.1	ft²
K	0.00980	HDS 5 Chart	1	
M	2.00000	HDS 5 Scale	1	
C	0.03980	Equation Form	1	
Y	0.67000			

EXISTING CONDITIONS BASIN 100



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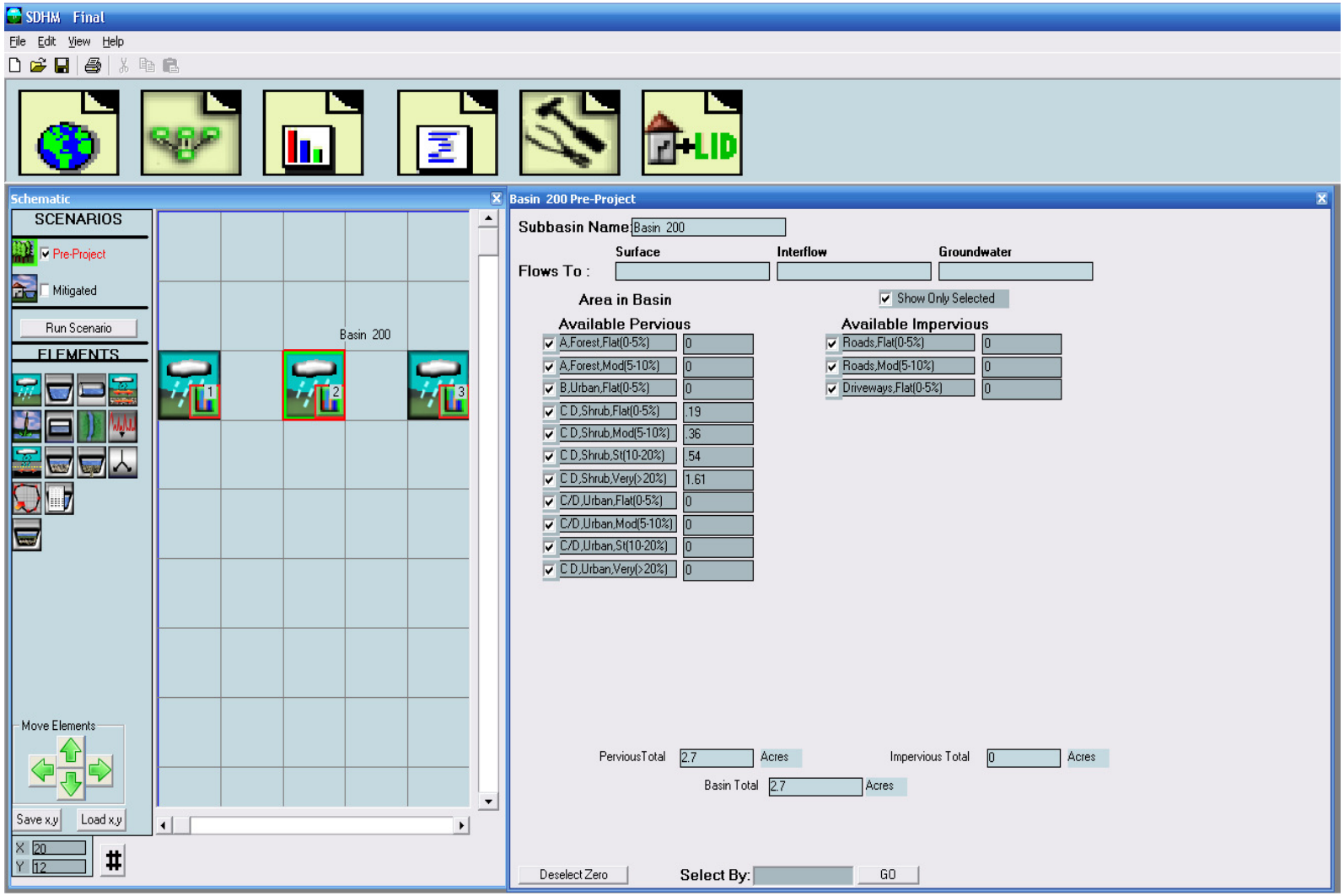

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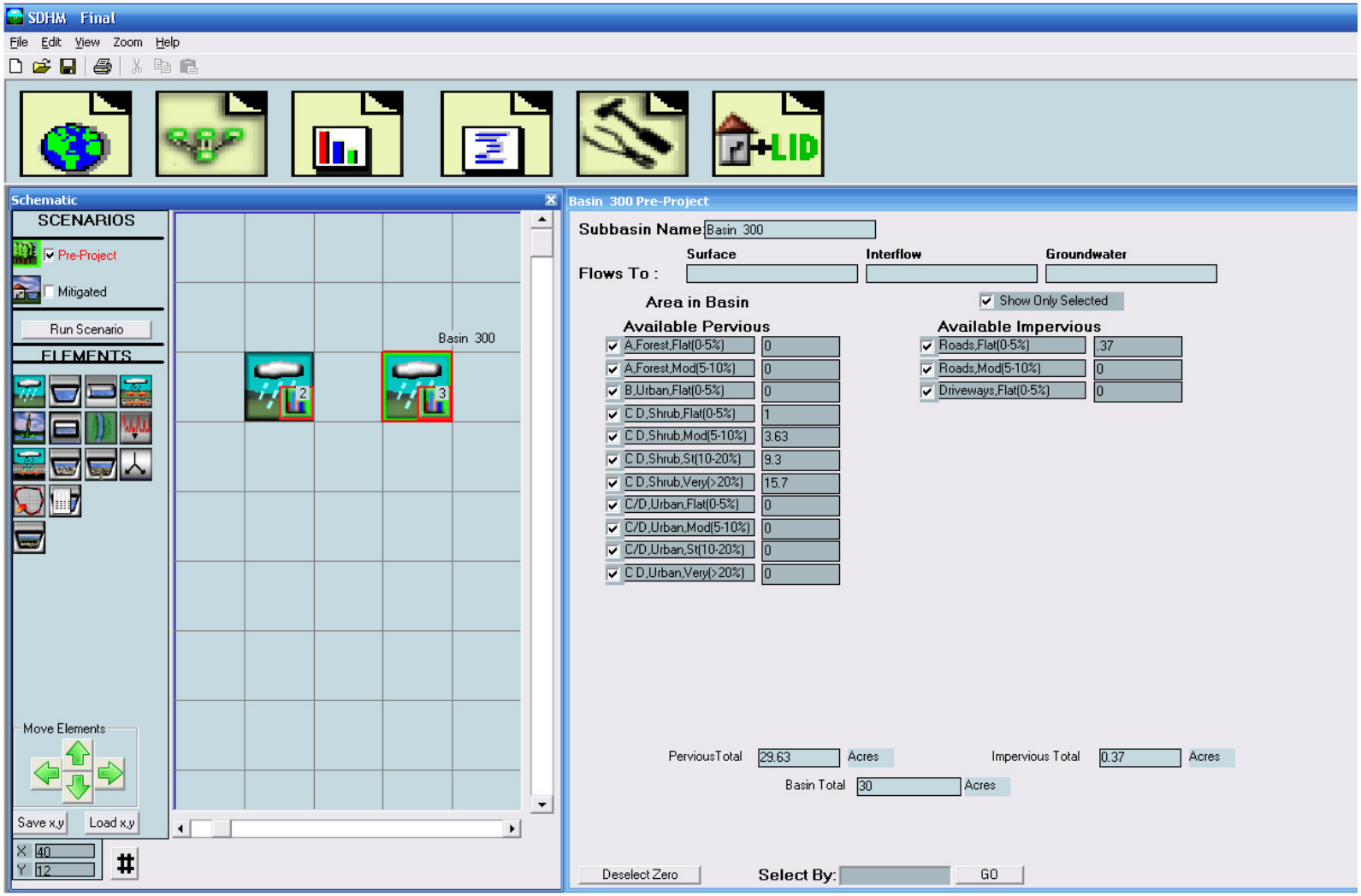

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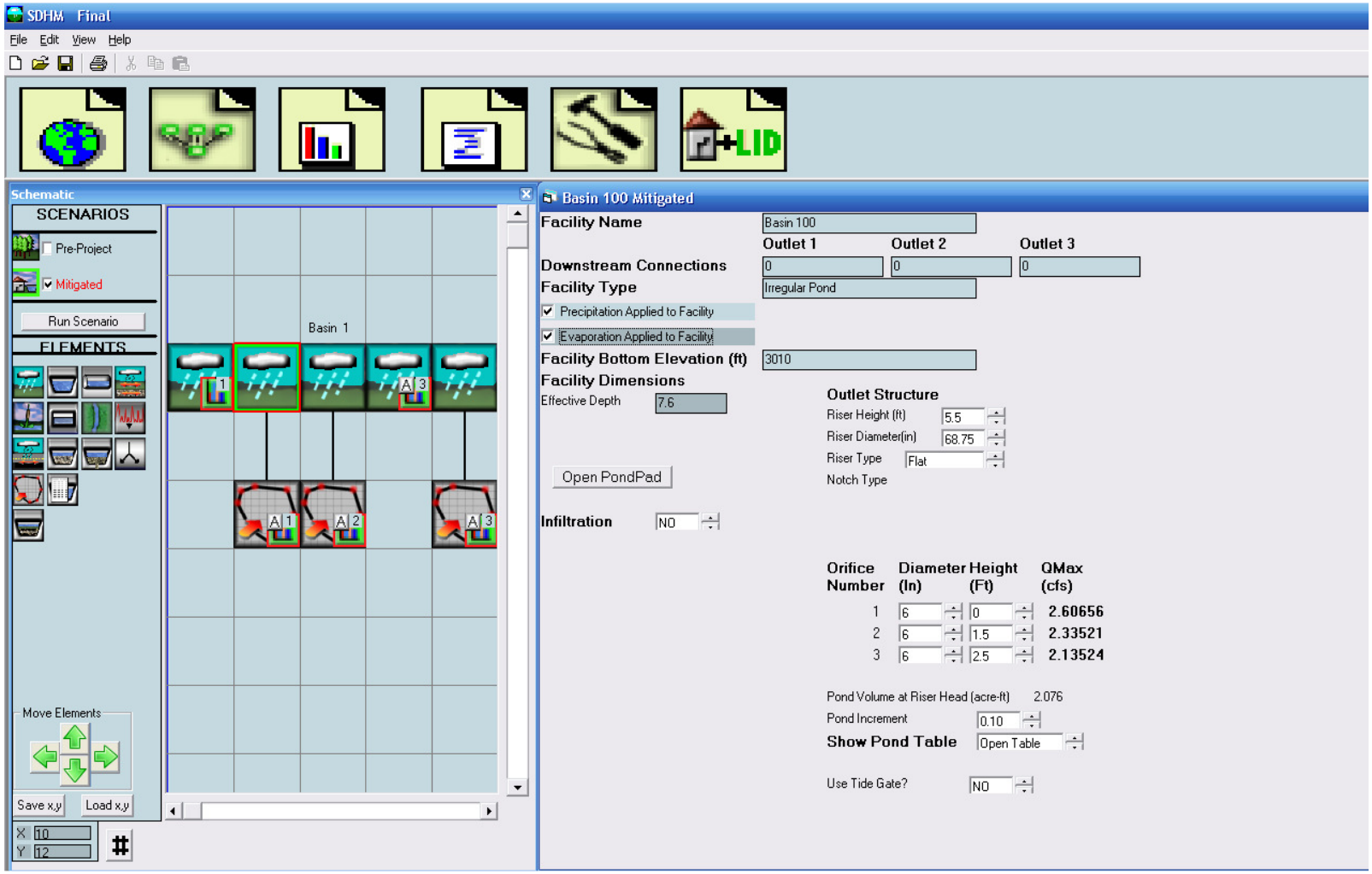
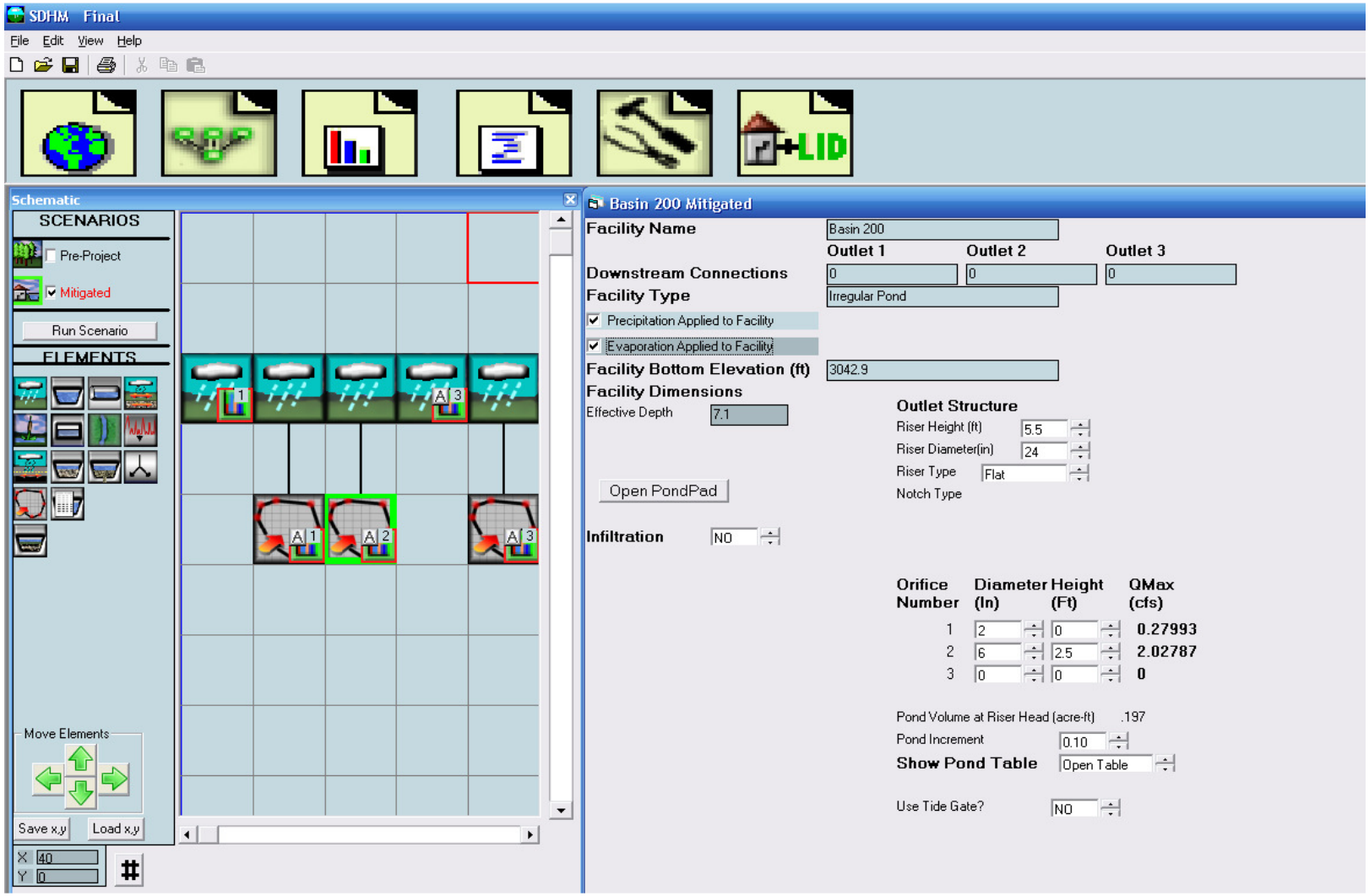
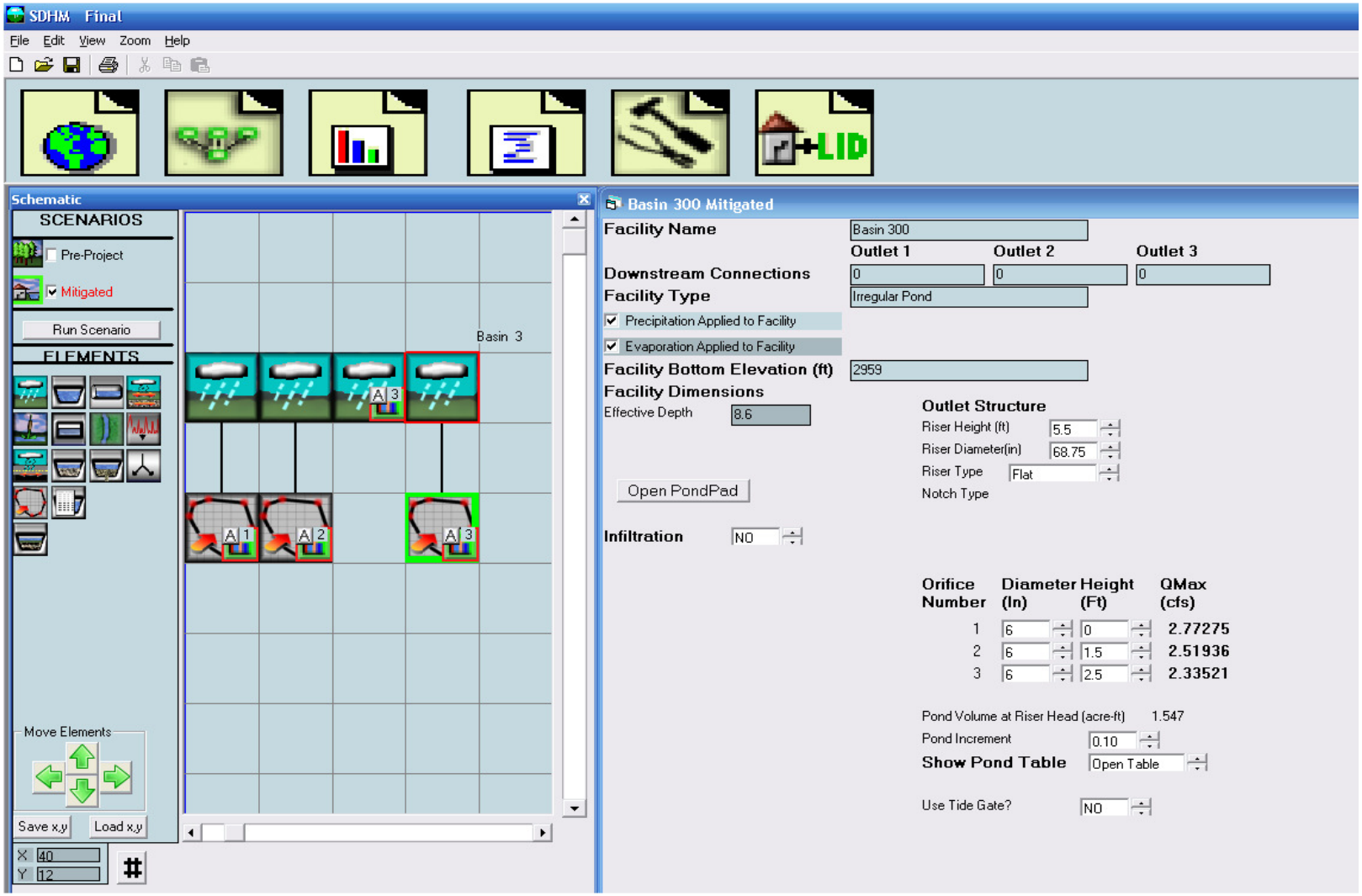


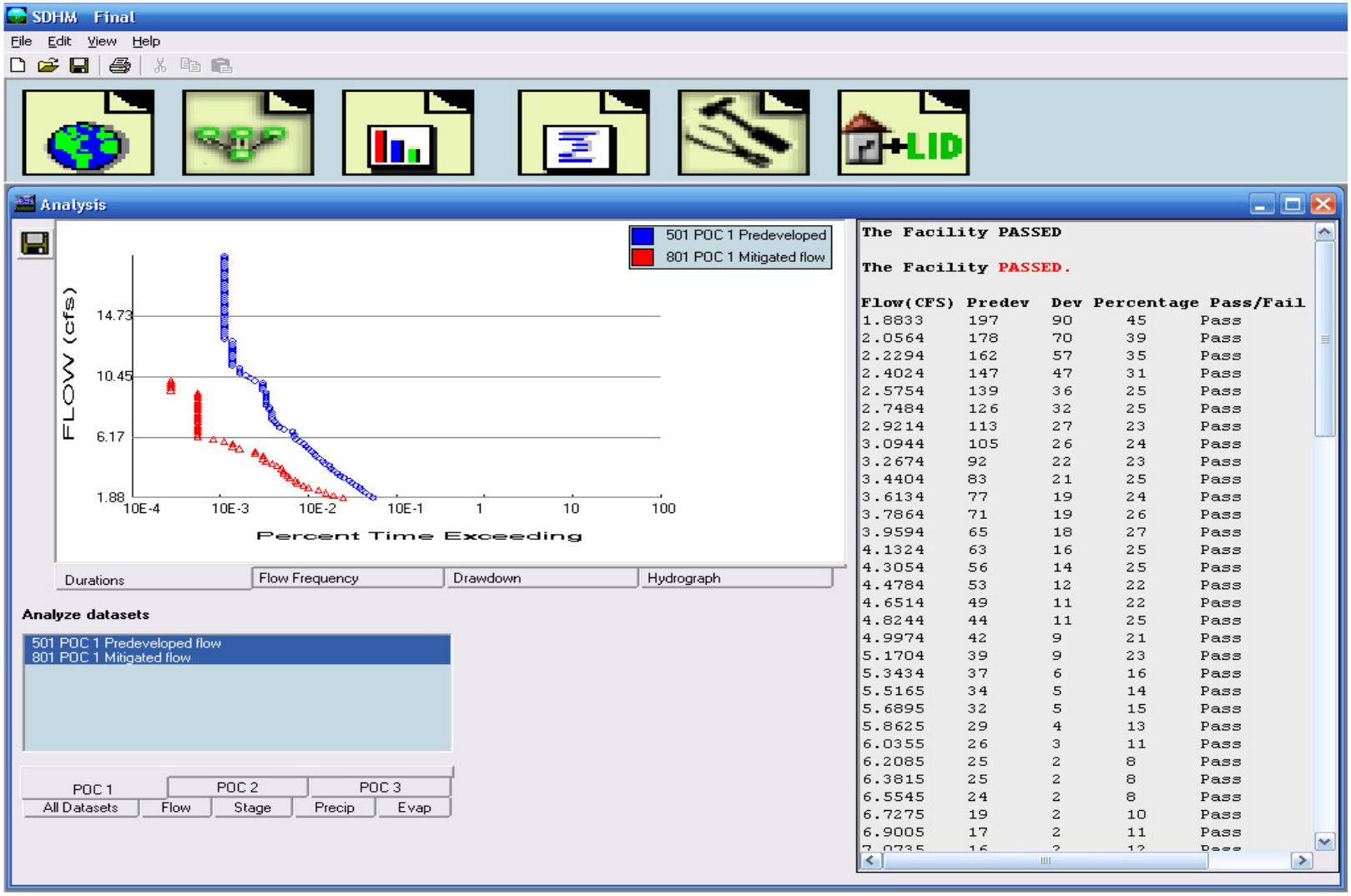
DETENTION BASIN 200



DETENTION BASIN 300

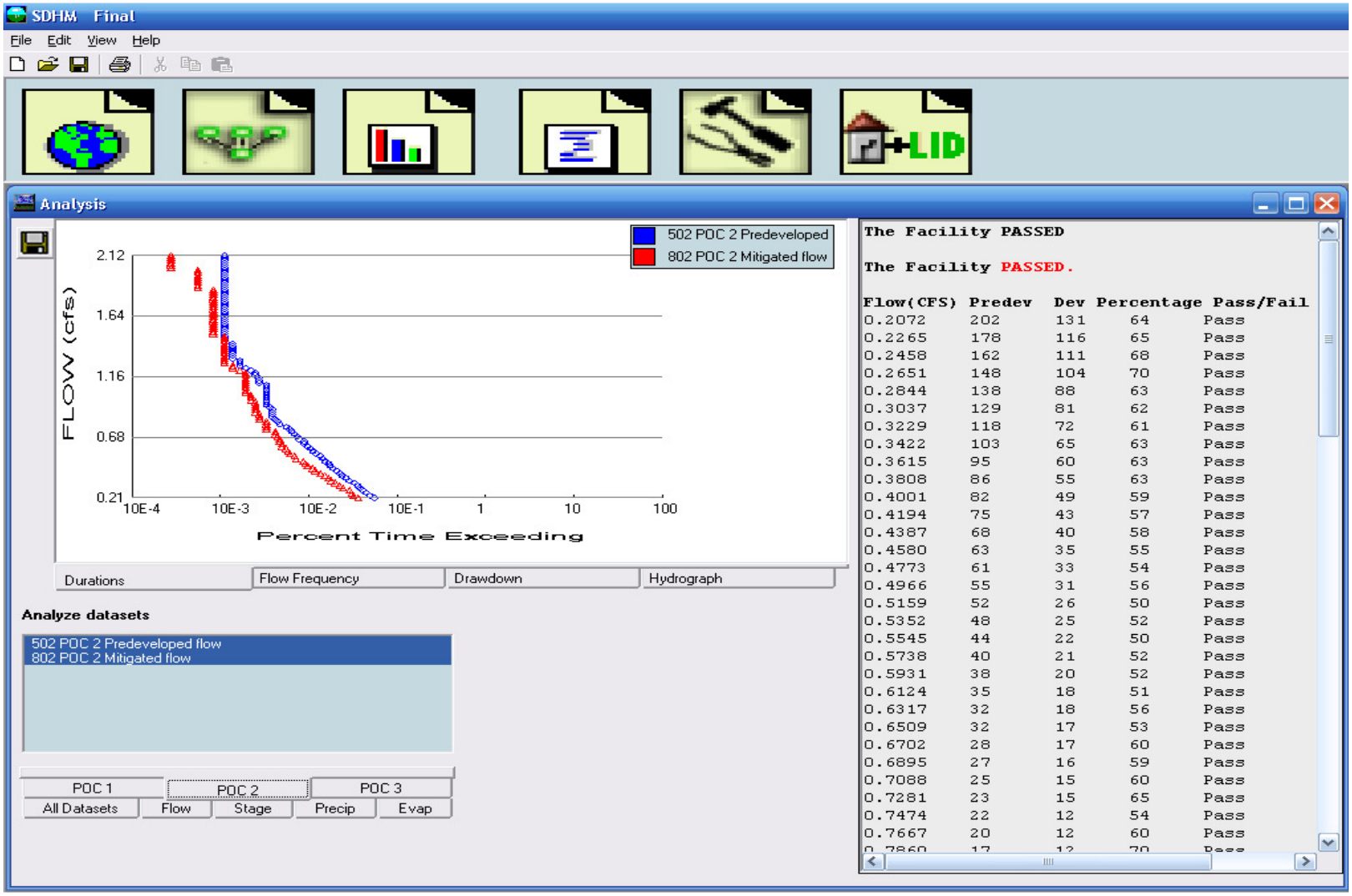


POC BASIN 100



Flow(CFS)	Predev	Dev	Percentage	Pass/Fail
1.8833	197	90	45	Pass
2.0564	178	70	39	Pass
2.2294	162	57	35	Pass
2.4024	147	47	31	Pass
2.5754	139	36	25	Pass
2.7484	126	32	25	Pass
2.9214	113	27	23	Pass
3.0944	105	26	24	Pass
3.2674	92	22	23	Pass
3.4404	83	21	25	Pass
3.6134	77	19	24	Pass
3.7864	71	19	26	Pass
3.9594	65	18	27	Pass
4.1324	63	16	25	Pass
4.3054	56	14	25	Pass
4.4784	53	12	22	Pass
4.6514	49	11	22	Pass
4.8244	44	11	25	Pass
4.9974	42	9	21	Pass
5.1704	39	9	23	Pass
5.3434	37	6	16	Pass
5.5165	34	5	14	Pass
5.6895	32	5	15	Pass
5.8625	29	4	13	Pass
6.0355	26	3	11	Pass
6.2085	25	2	8	Pass
6.3815	25	2	8	Pass
6.5545	24	2	8	Pass
6.7275	19	2	10	Pass
6.9005	17	2	11	Pass

POC BASIN 200



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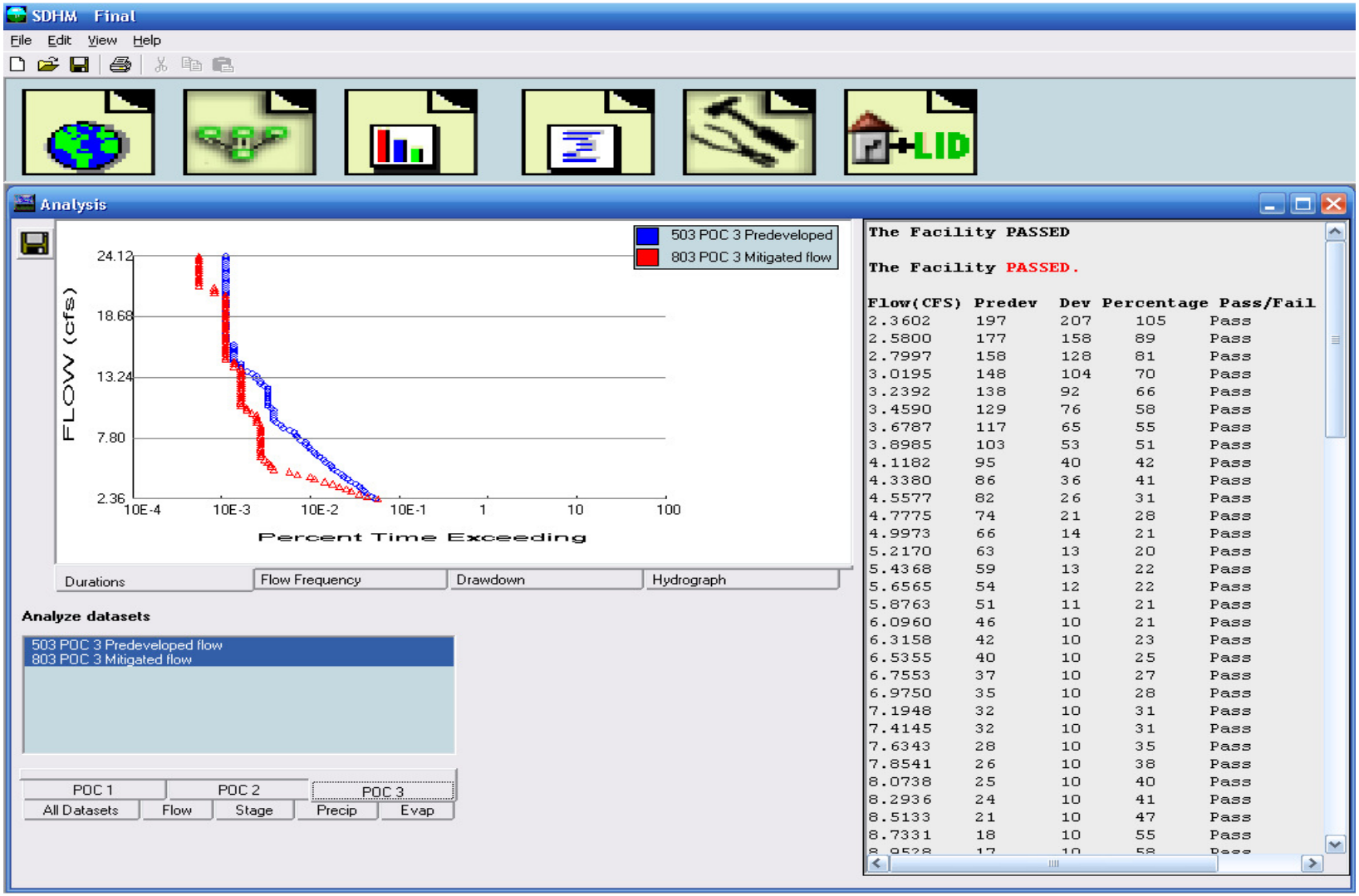
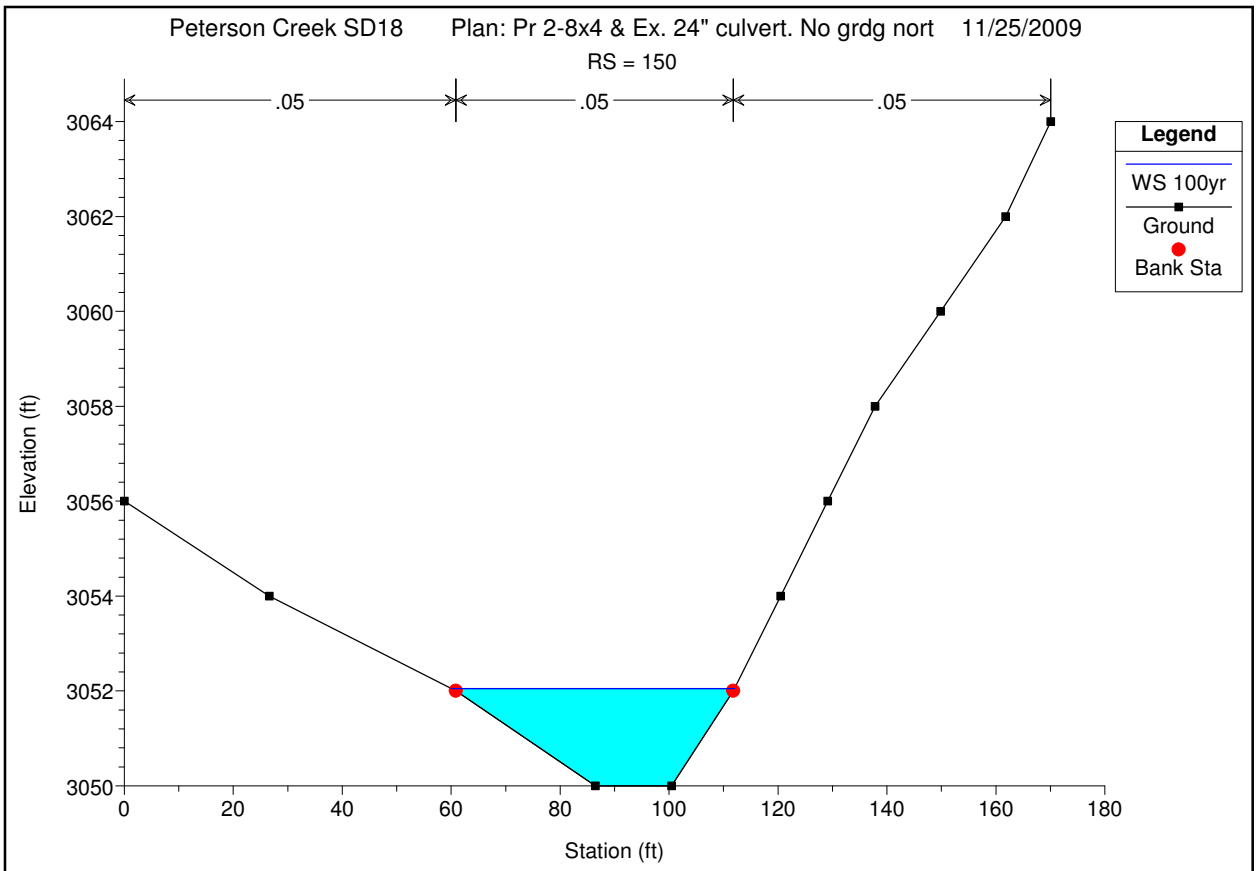
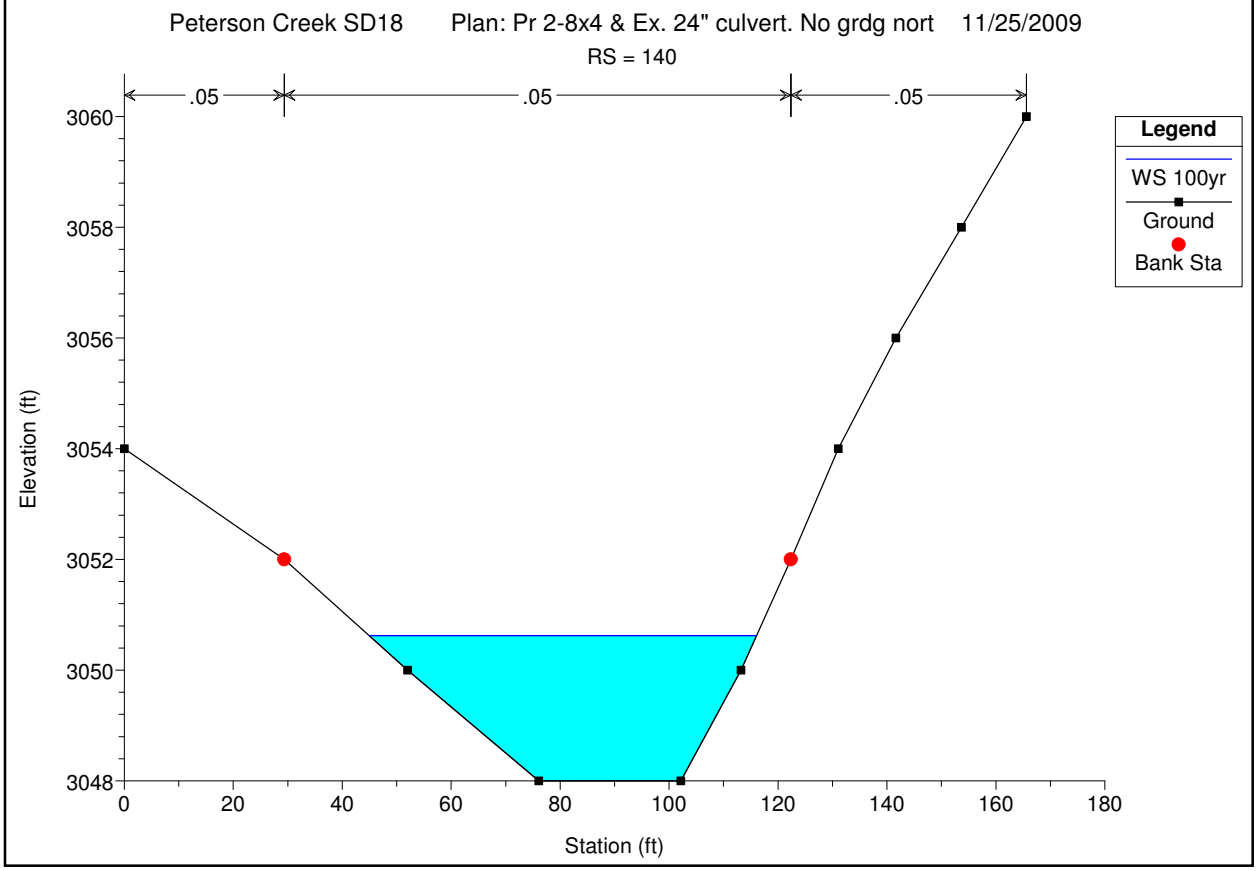
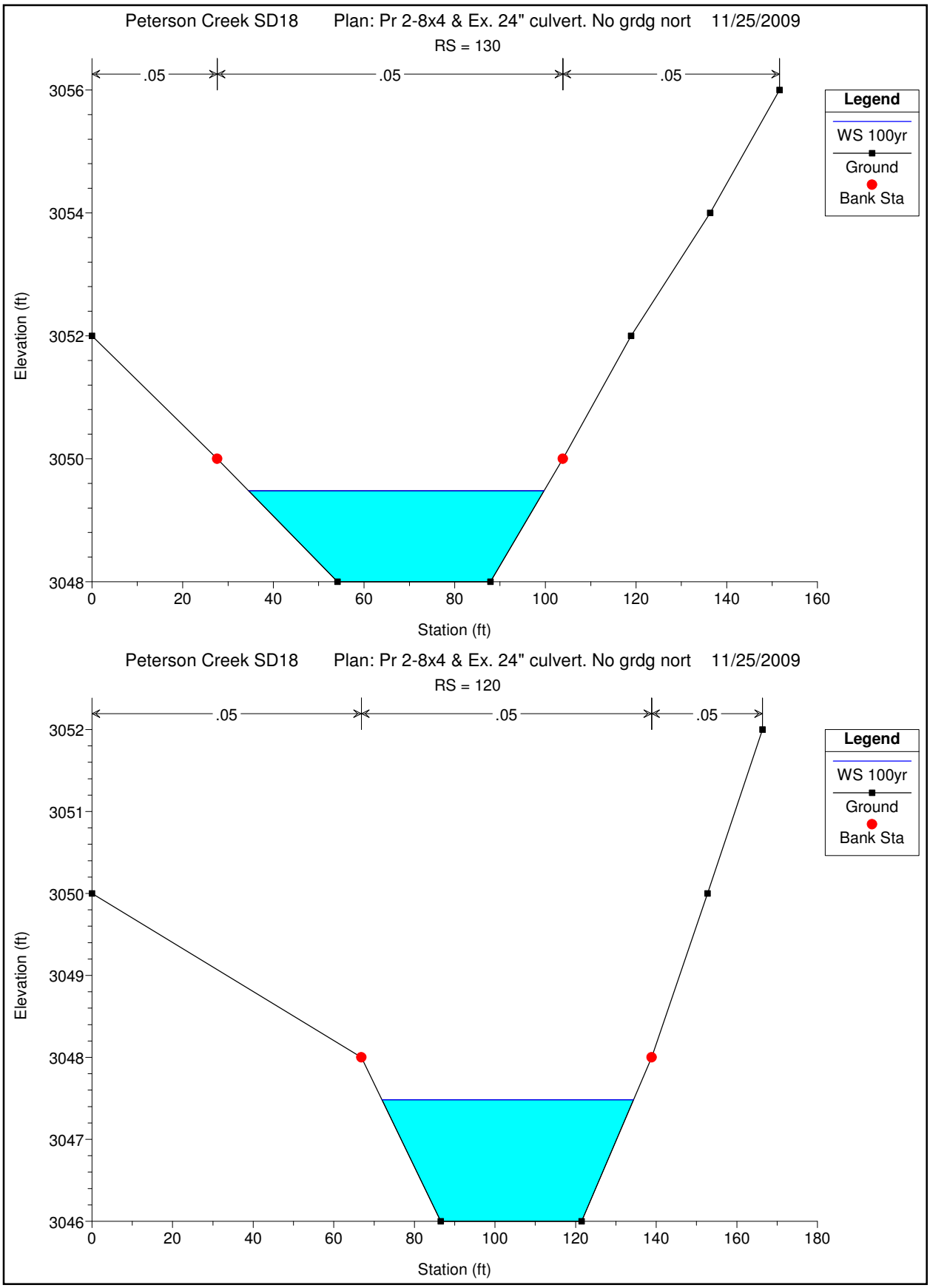
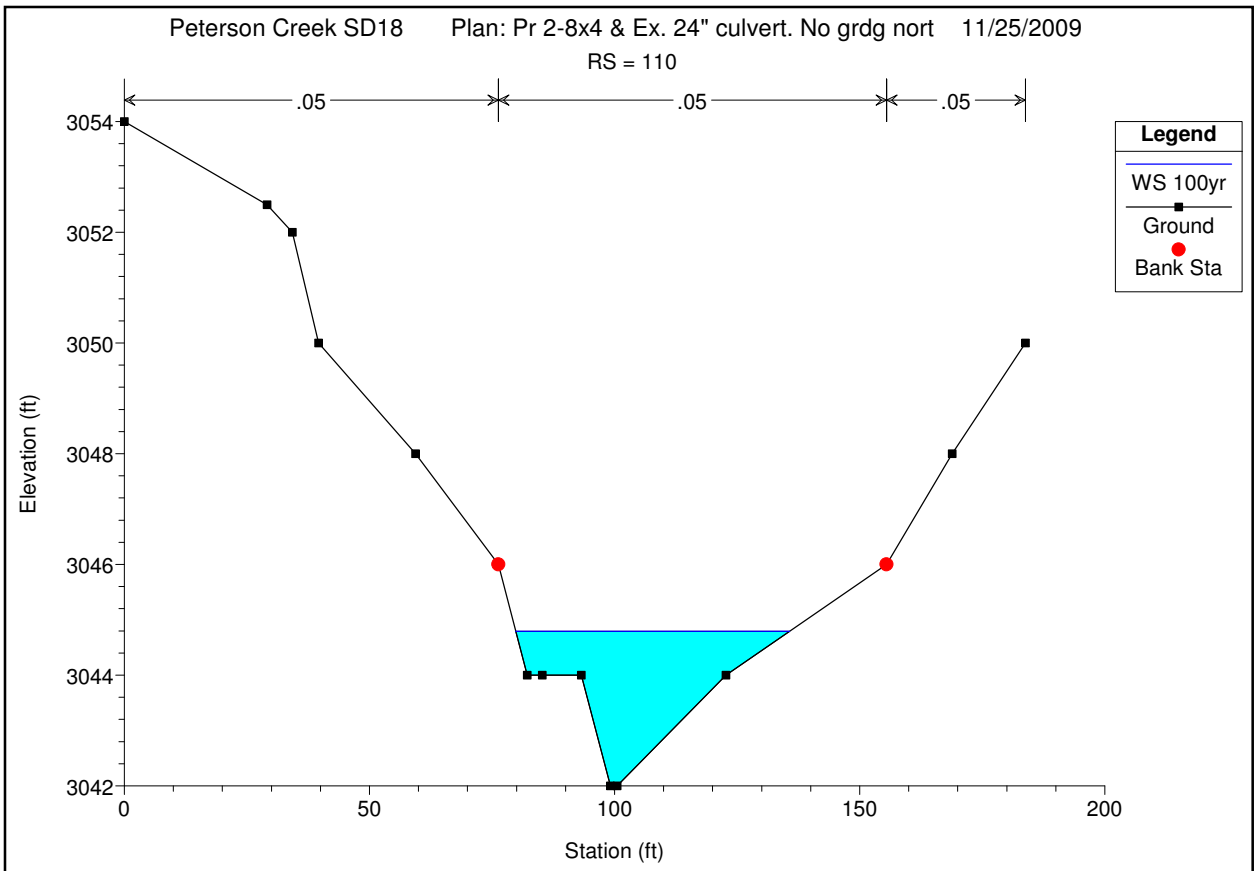


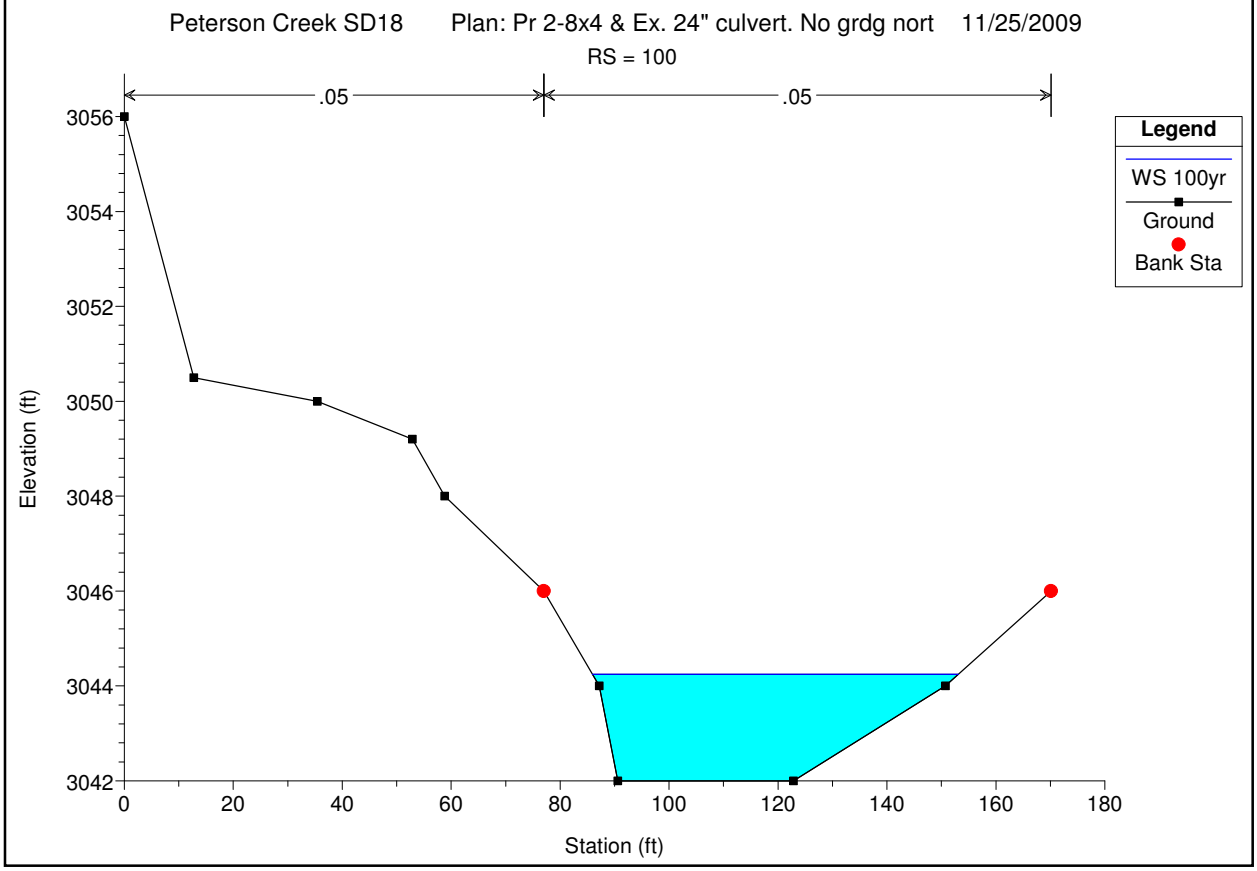
HEC-RAS CALCULATIONS

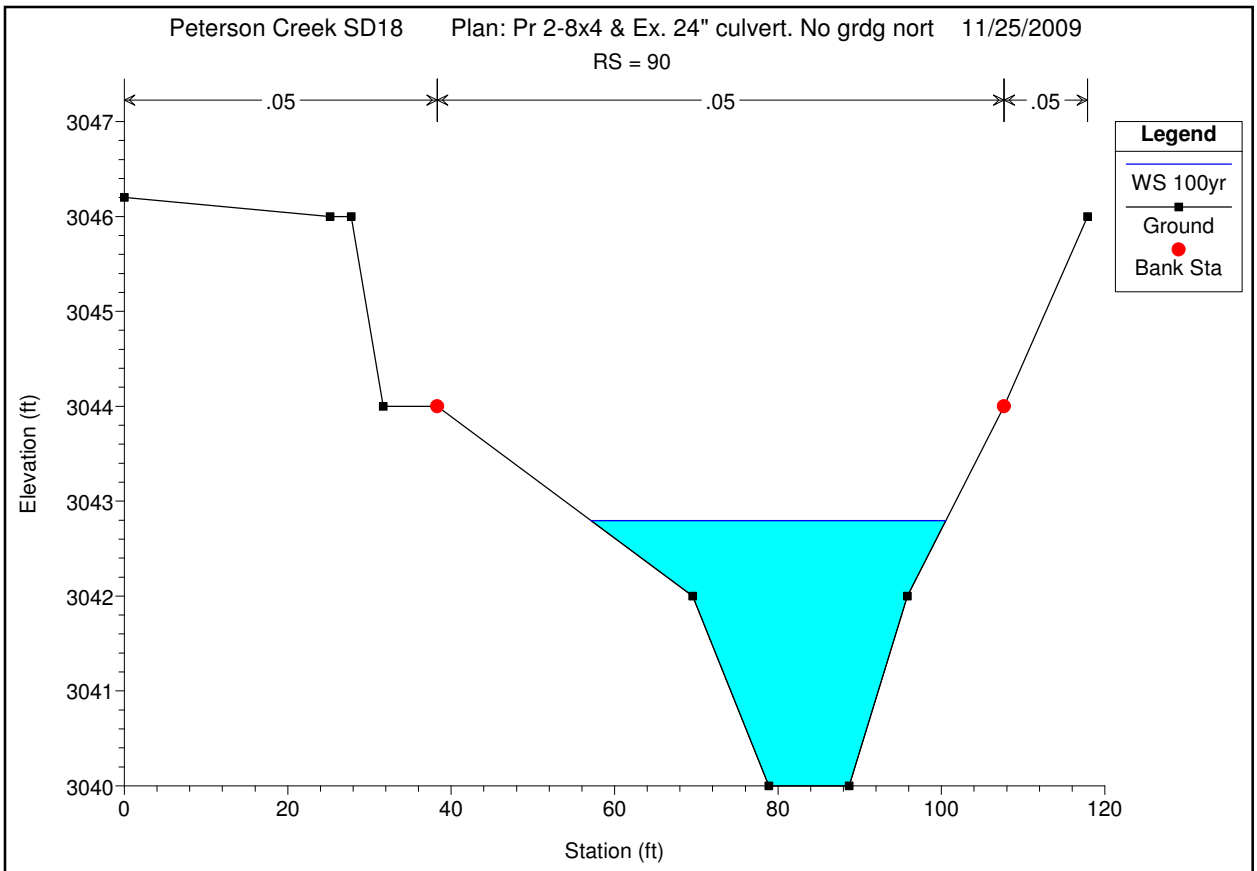

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 150
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3064
3062
3060
3058
3056
3054
3052
3050
0
20
40
60
80
100
120
140
160
180
Station (ft)

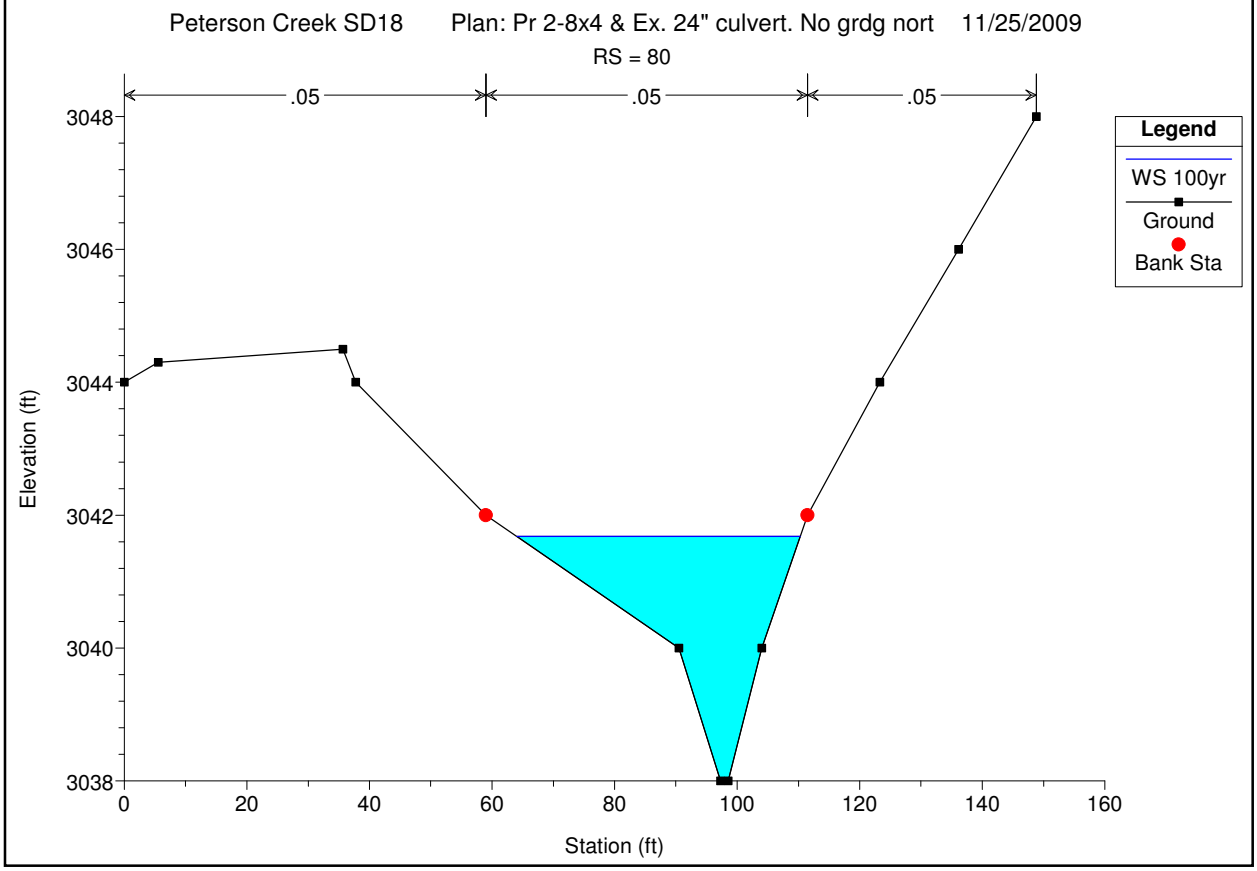

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 140
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3060
3058
3056
3054
3052
3050
3048
0
20
40
60
80
100
120
140
160
180
Station (ft)

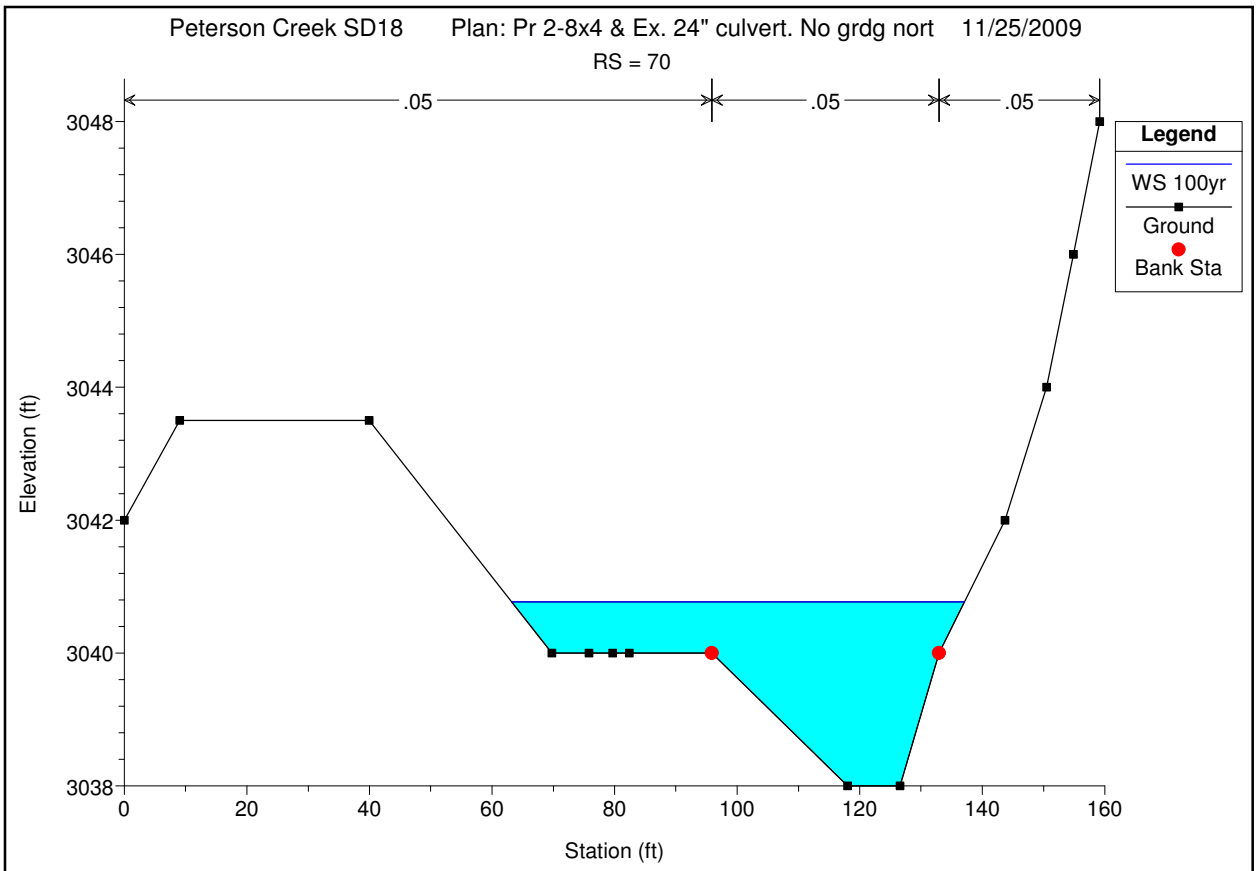

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 130
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3056
3054
3052
3050
3048
0
20
40
60
80
100
120
140
160
Station (ft)
Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 120
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3052
3051
3050
3049
3048
3047
3046
0
20
40
60
80
100
120
140
160
180
Station (ft)

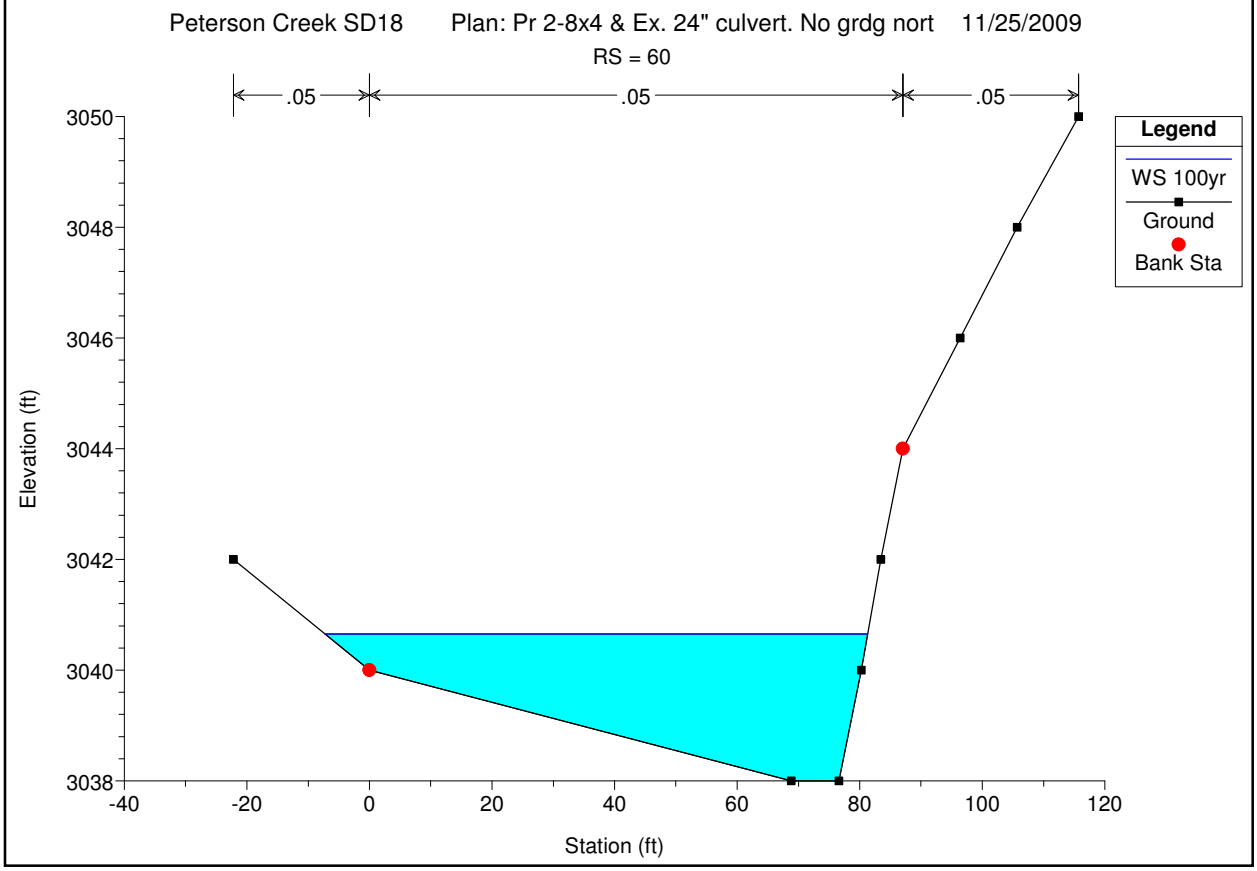

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 110
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3054
3052
3050
3048
3046
3044
3042
0
50
100
150
200
Station (ft)

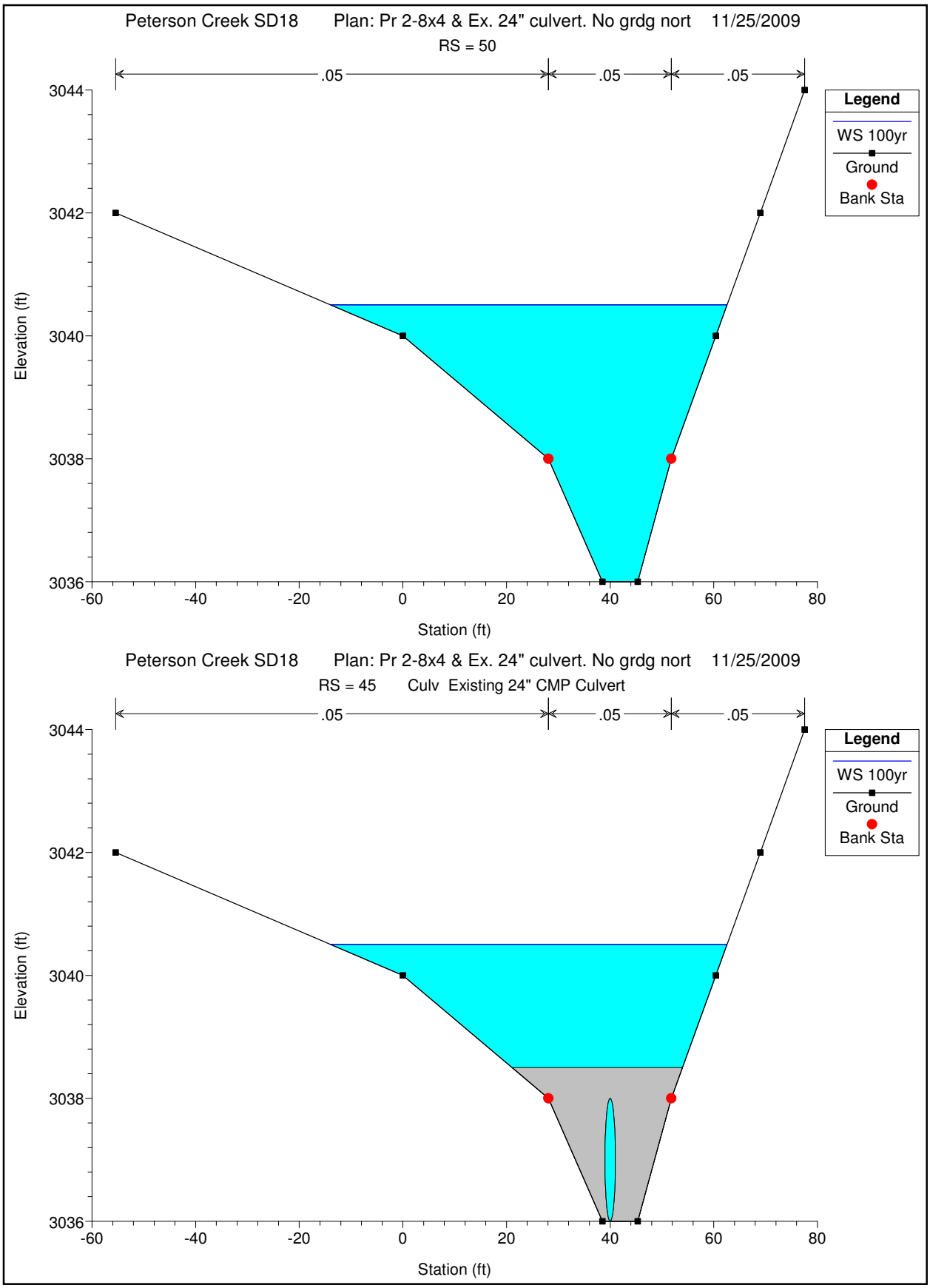

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 100
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3056
3054
3052
3050
3048
3046
3044
3042
0
20
40
60
80
100
120
140
160
180
Station (ft)

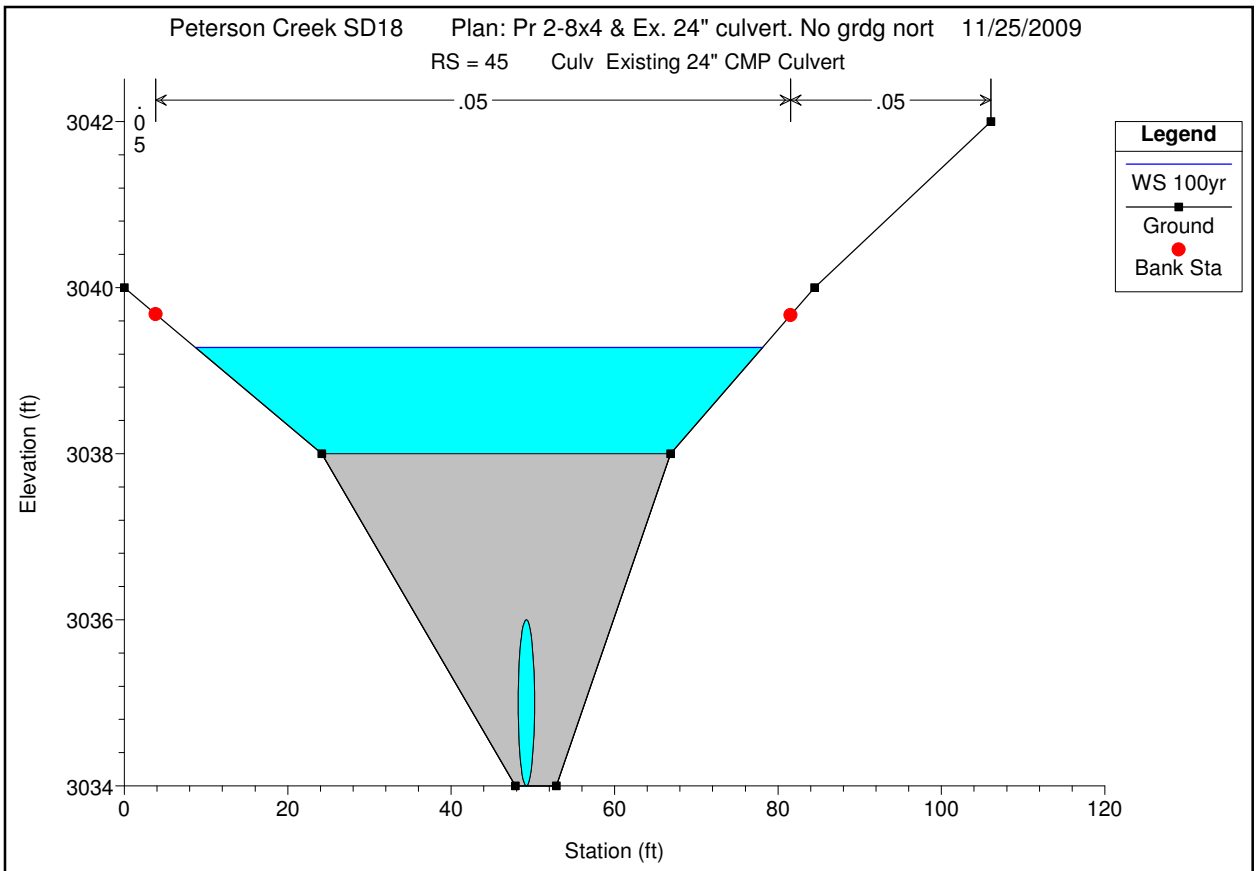

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 90
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3047
3046
3045
3044
3043
3042
3041
3040
0
20
40
60
80
100
120

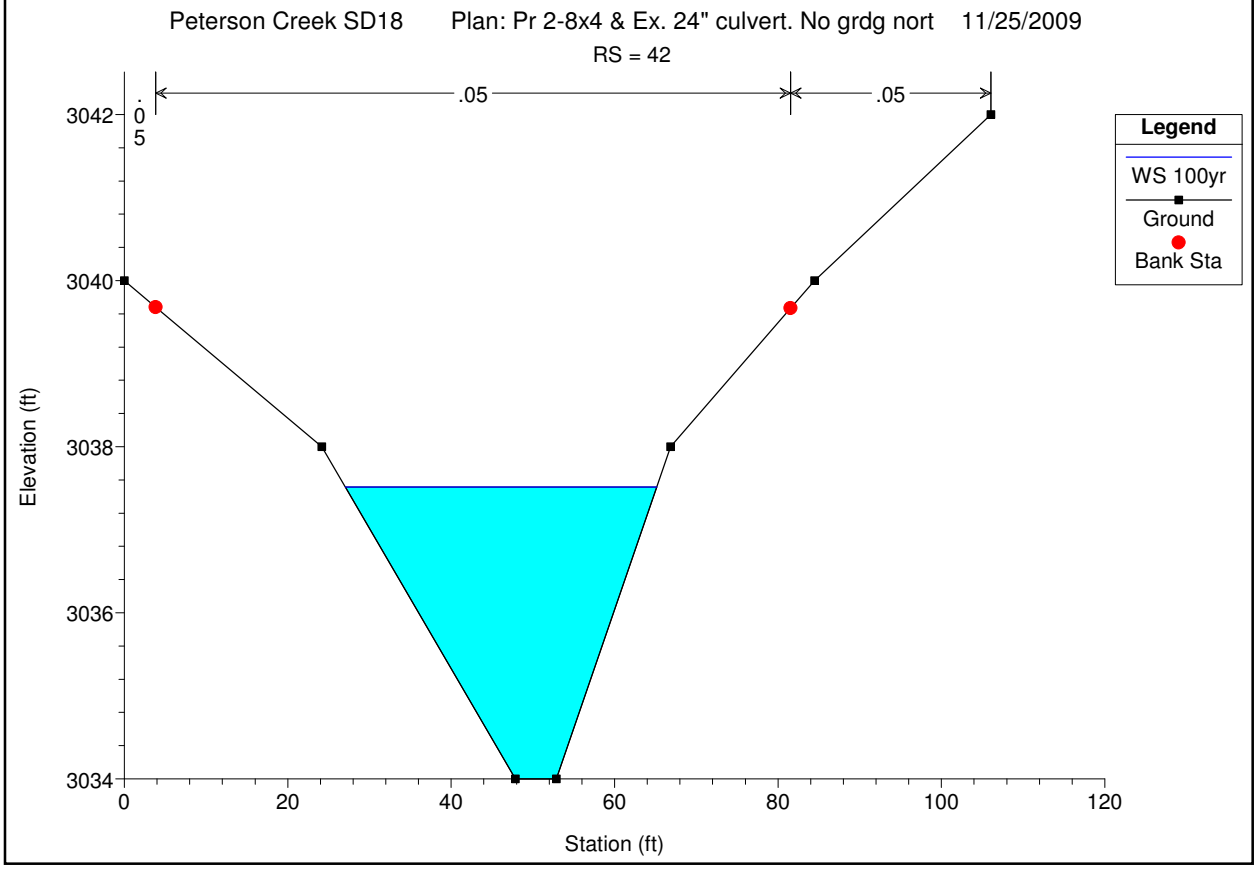

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 80
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3048
3046
3044
3042
3040
3038
0
20
40
60
80
100
120
140
160

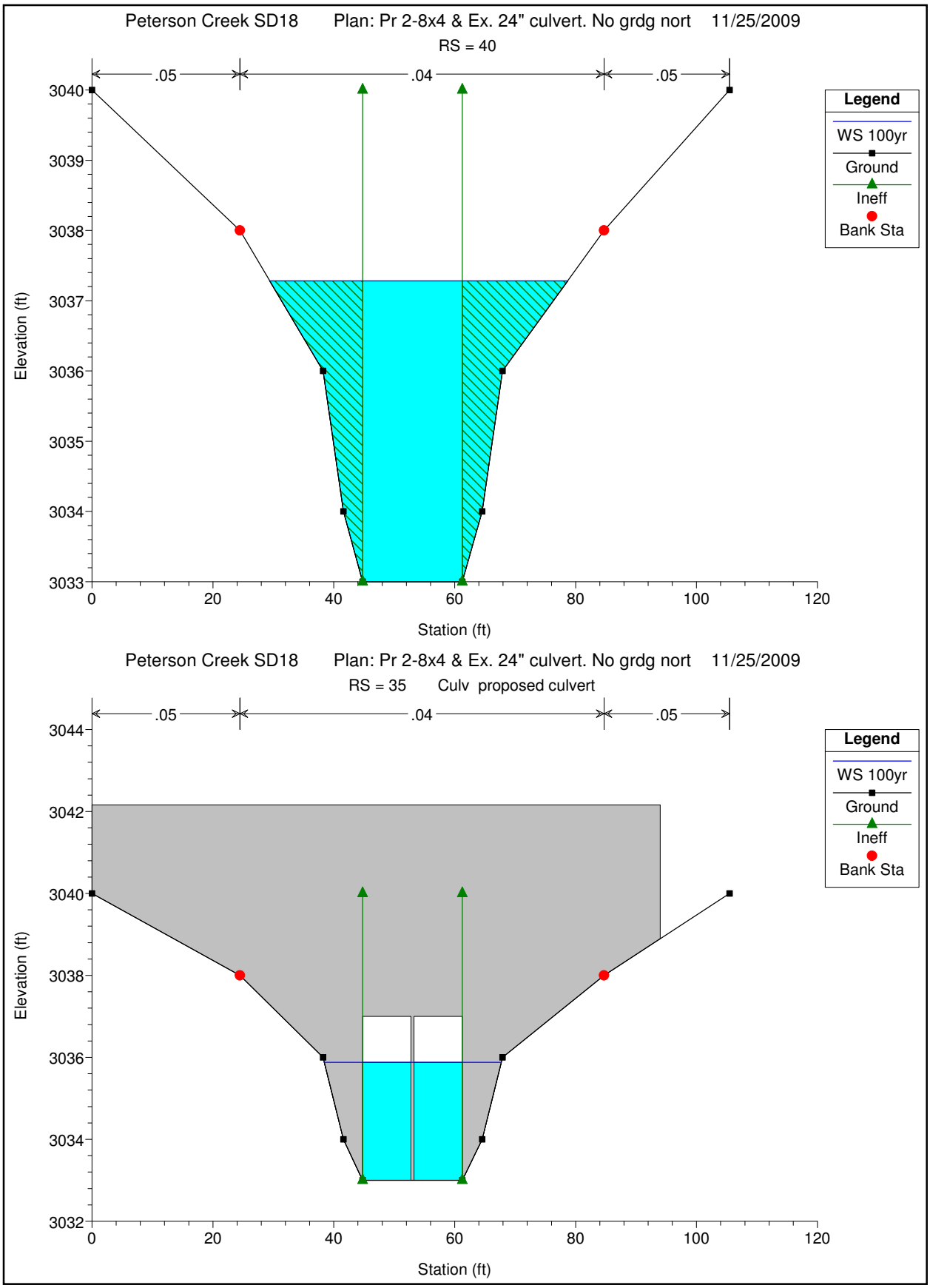

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 70
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3048
3046
3044
3042
3040
3038
0
20
40
60
80
100
120
140
160
Station (ft)

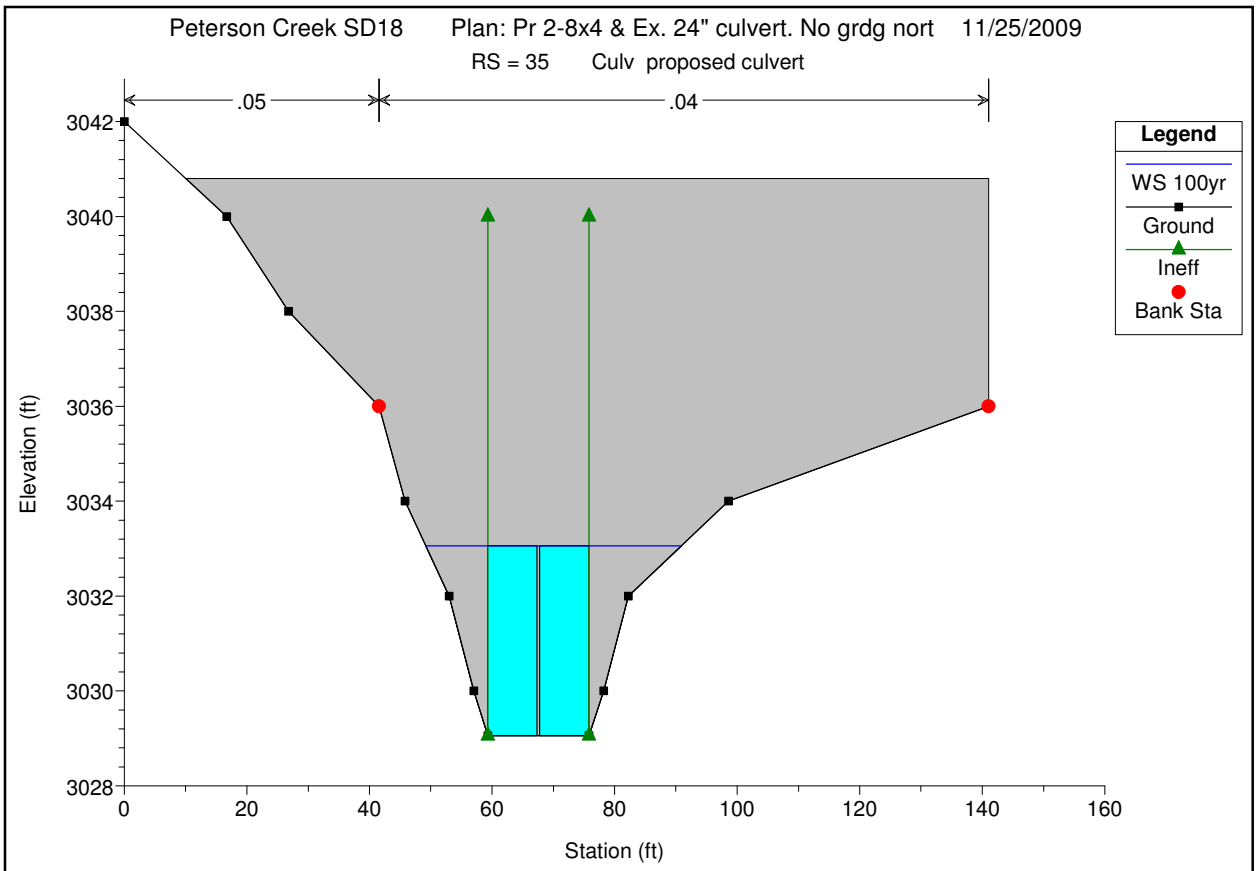

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 60
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3050
3048
3046
3044
3042
3040
3038
-40
-20
0
20
40
60
80
100
120
Station (ft)

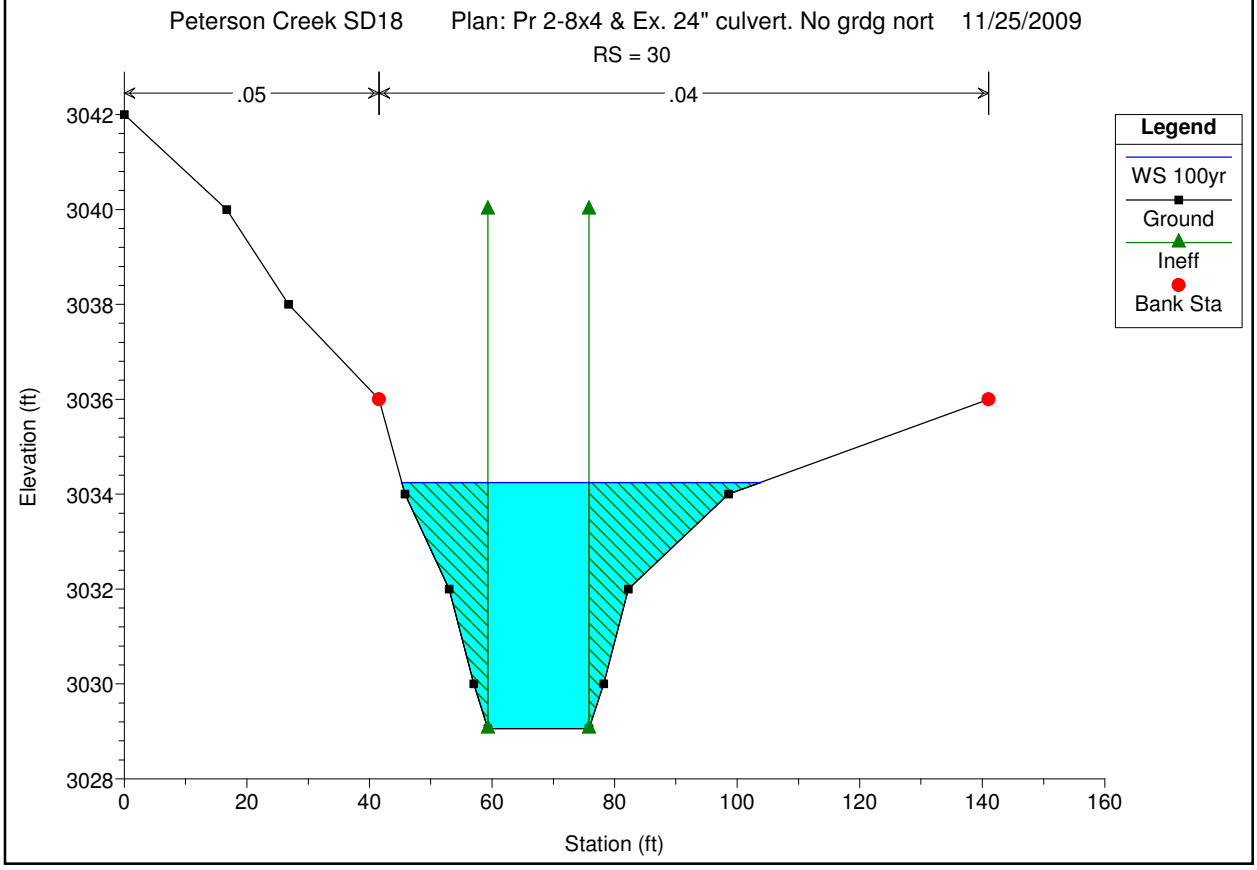

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 50
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3044
3042
3040
3038
3036
-60
-40
-20
0
20
40
60
80
Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 45 Culv Existing 24" CMP Culvert
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3044
3042
3040
3038
3036
-60
-40
-20
0
20
40
60
80

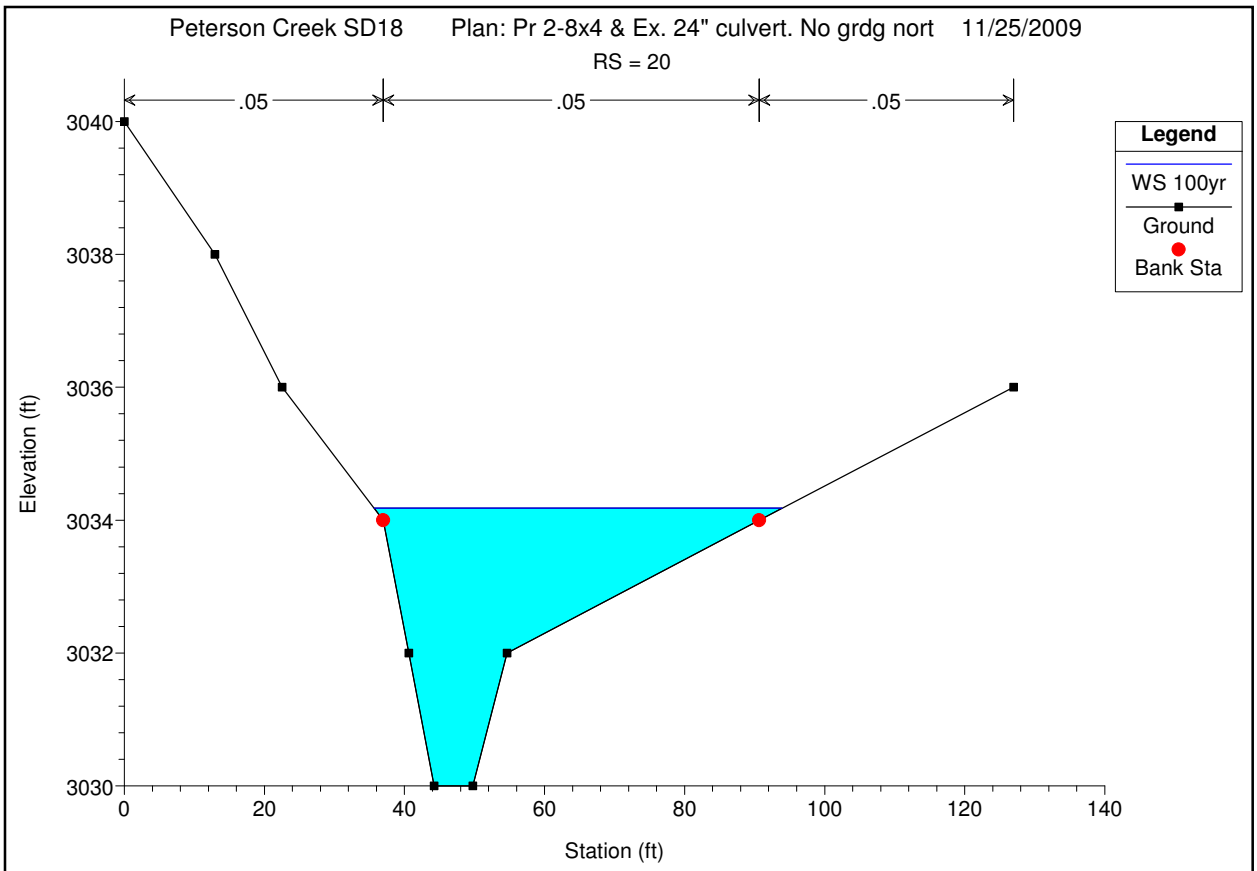

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 45 Culv Existing 24" CMP Culvert
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3042
3040
3038
3036
3034
0
20
40
60
80
100
120
Station (ft)

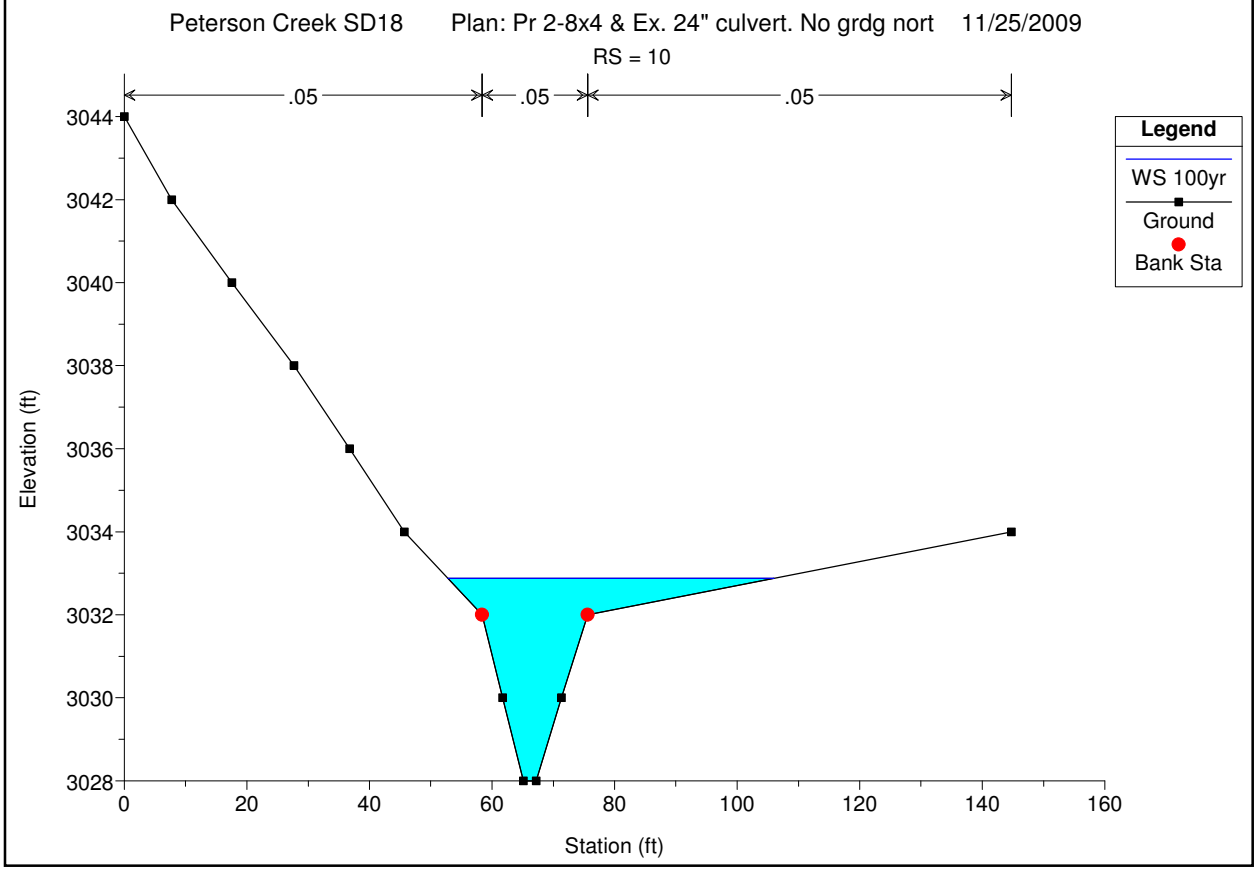

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 42
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3042
3040
3038
3036
3034
0
20
40
60
80
100
120
Station (ft)


Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 40
.05
.04
.05
Legend
WS 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
3040
3039
3038
3037
3036
3035
3034
3033
0
20
40
60
80
100
120
Station (ft)
Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 35 Culv proposed culvert
.05
.04
.05
Legend
WS 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
3044
3042
3040
3038
3036
3034
3032
0
20
40
60
80
100
120
Station (ft)


Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 35 Culv proposed culvert
.05
.04
Legend
WS 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3042
3040
3038
3036
3034
3032
3030
3028
0
20
40
60
80
100
120
140
160

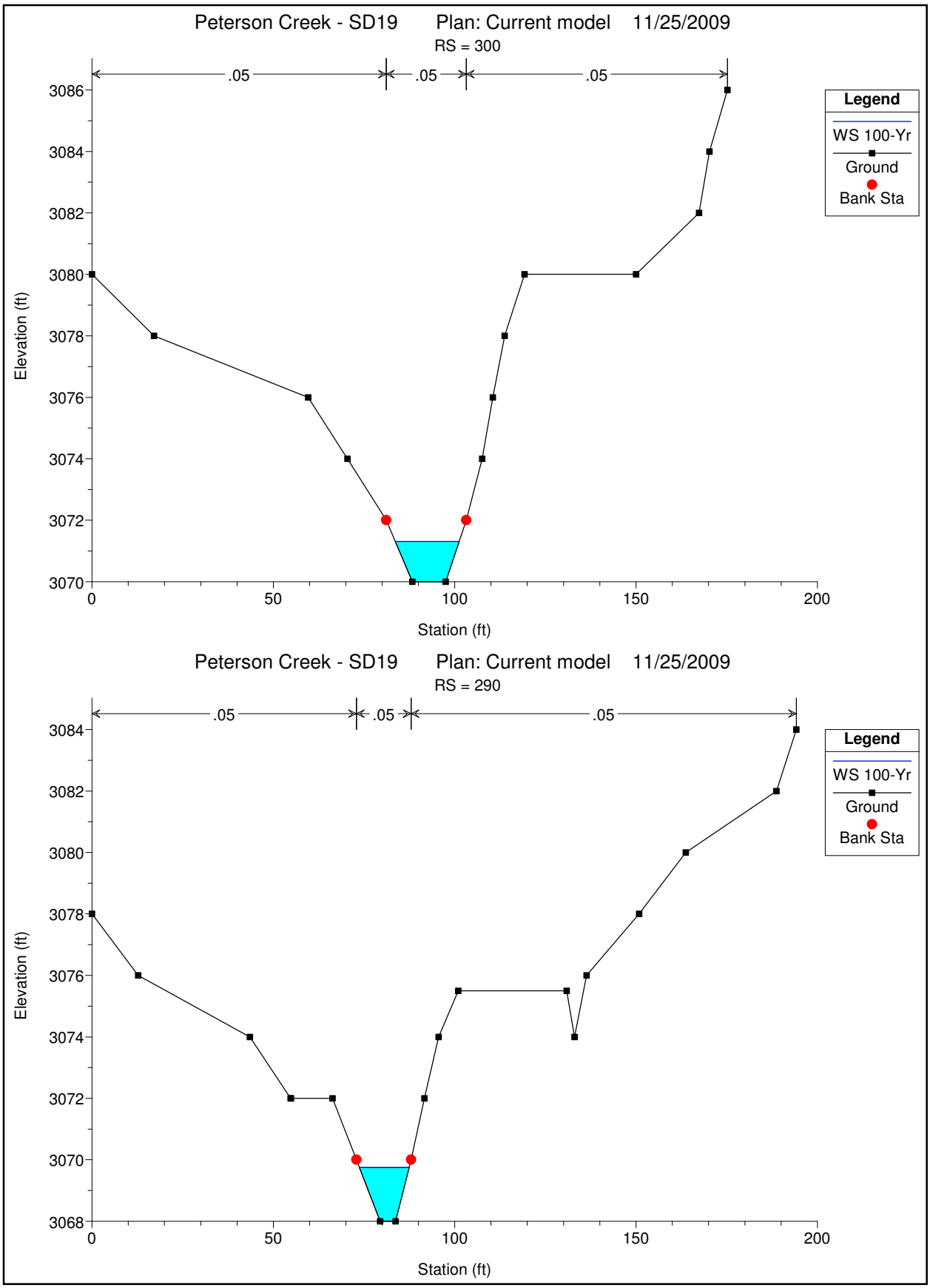

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 30
.05
.04
Legend
WS 100yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
3042
3040
3038
3036
3034
3032
3030
3028
0
20
40
60
80
100
120
140
160

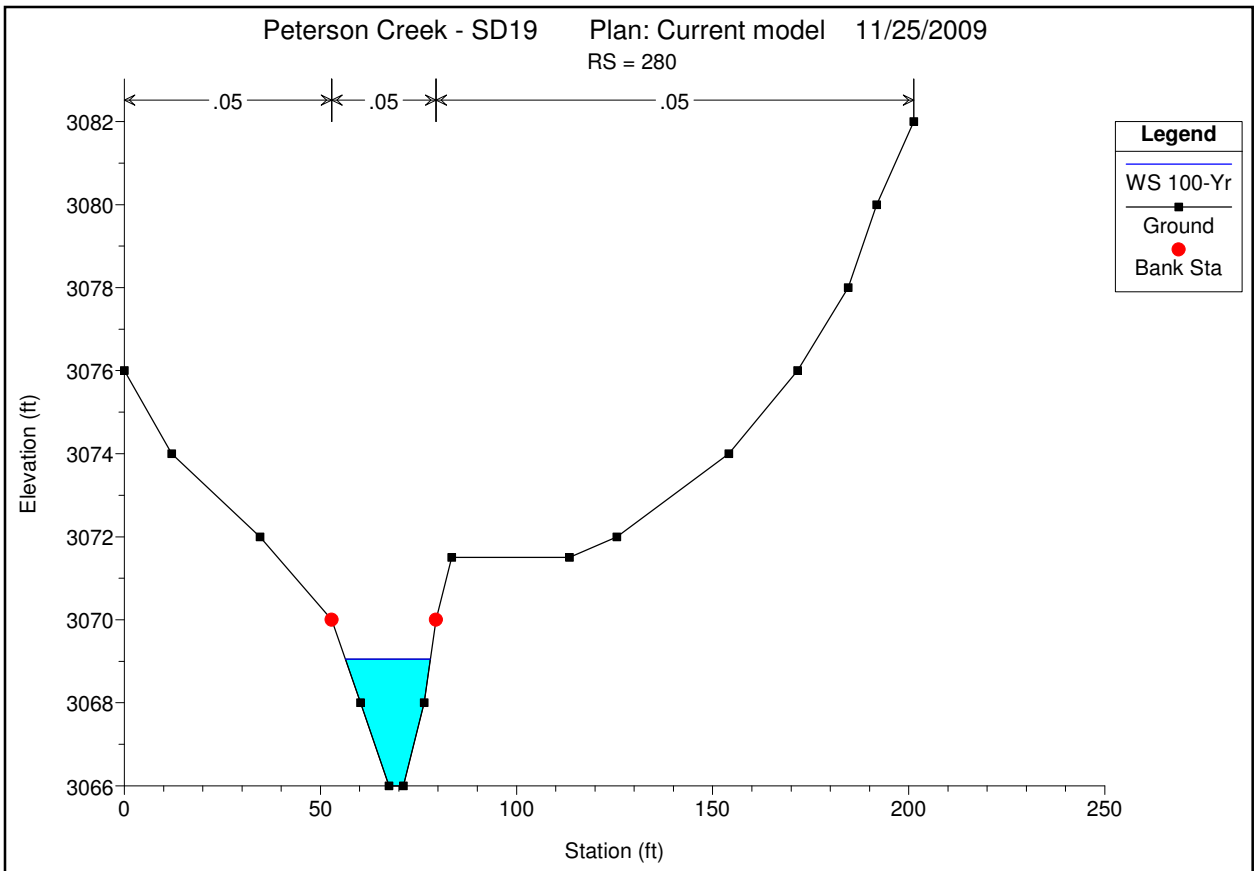

Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 20
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3040
3038
3036
3034
3032
3030
0
20
40
60
80
100
120
140
Station (ft)


Peterson Creek SD18 Plan: Pr 2-8x4 & Ex. 24" culvert. No grdg nort 11/25/2009
RS = 10
.05
.05
.05
Legend
WS 100yr
Ground
Bank Sta
Elevation (ft)
3044
3042
3040
3038
3036
3034
3032
3030
3028
0
20
40
60
80
100
120
140
160
Station (ft)

HEC-RAS Plan: 8x4 & 24" River: River #1 Reach: Reach #1 Profile: 100yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach #1	150	100yr	443.80	3050.00	3052.05	3052.05	3052.72	0.033842	6.57	67.55	52.06	1.01
Reach #1	140	100yr	443.80	3048.00	3050.62		3050.81	0.006168	3.45	128.57	71.12	0.45
Reach #1	130	100yr	443.80	3048.00	3049.48	3049.48	3050.05	0.035909	6.07	73.10	65.16	1.01
Reach #1	120	100yr	443.80	3046.00	3047.48	3047.48	3048.07	0.035464	6.15	72.13	62.42	1.01
Reach #1	110	100yr	443.80	3042.00	3044.79	3044.79	3045.44	0.035642	6.42	69.10	55.84	1.02
Reach #1	100	100yr	443.80	3042.00	3044.25		3044.49	0.009114	3.96	112.00	67.20	0.54
Reach #1	90	100yr	443.80	3040.00	3042.80	3042.80	3043.55	0.033283	6.95	63.88	43.45	1.01
Reach #1	80	100yr	443.80	3038.00	3041.68	3041.68	3042.41	0.034643	6.84	64.84	46.20	1.02
Reach #1	70	100yr	443.80	3038.00	3040.77		3041.14	0.012163	5.17	98.36	73.89	0.64
Reach #1	60	100yr	443.80	3038.00	3040.65		3040.81	0.005422	3.14	143.09	88.53	0.42
Reach #1	50	100yr	443.80	3036.00	3040.51	3039.02	3040.69	0.002854	3.81	149.22	76.57	0.34
Reach #1	45		Culvert									
Reach #1	42	100yr	443.80	3034.00	3037.52		3038.05	0.015967	5.86	75.77	38.11	0.73
Reach #1	40	100yr	443.80	3033.00	3037.28	3035.84	3037.90	0.004108	6.28	70.67	49.31	0.53
Reach #1	35		Culvert									
Reach #1	30	100yr	443.80	3029.06	3034.25	3031.90	3034.67	0.002169	5.18	85.60	58.58	0.40
Reach #1	20	100yr	443.80	3030.00	3034.18		3034.51	0.011165	4.57	97.36	58.24	0.60
Reach #1	10	100yr	443.80	3028.00	3032.88	3032.88	3033.72	0.016704	7.62	69.48	53.19	0.76


Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 300
.05
.05
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3086
3084
3082
3080
3078
3076
3074
3072
3070
0
50
100
150
200
Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 290
.05
.05
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3084
3082
3080
3078
3076
3074
3072
3070
3068
0
50
100
150
200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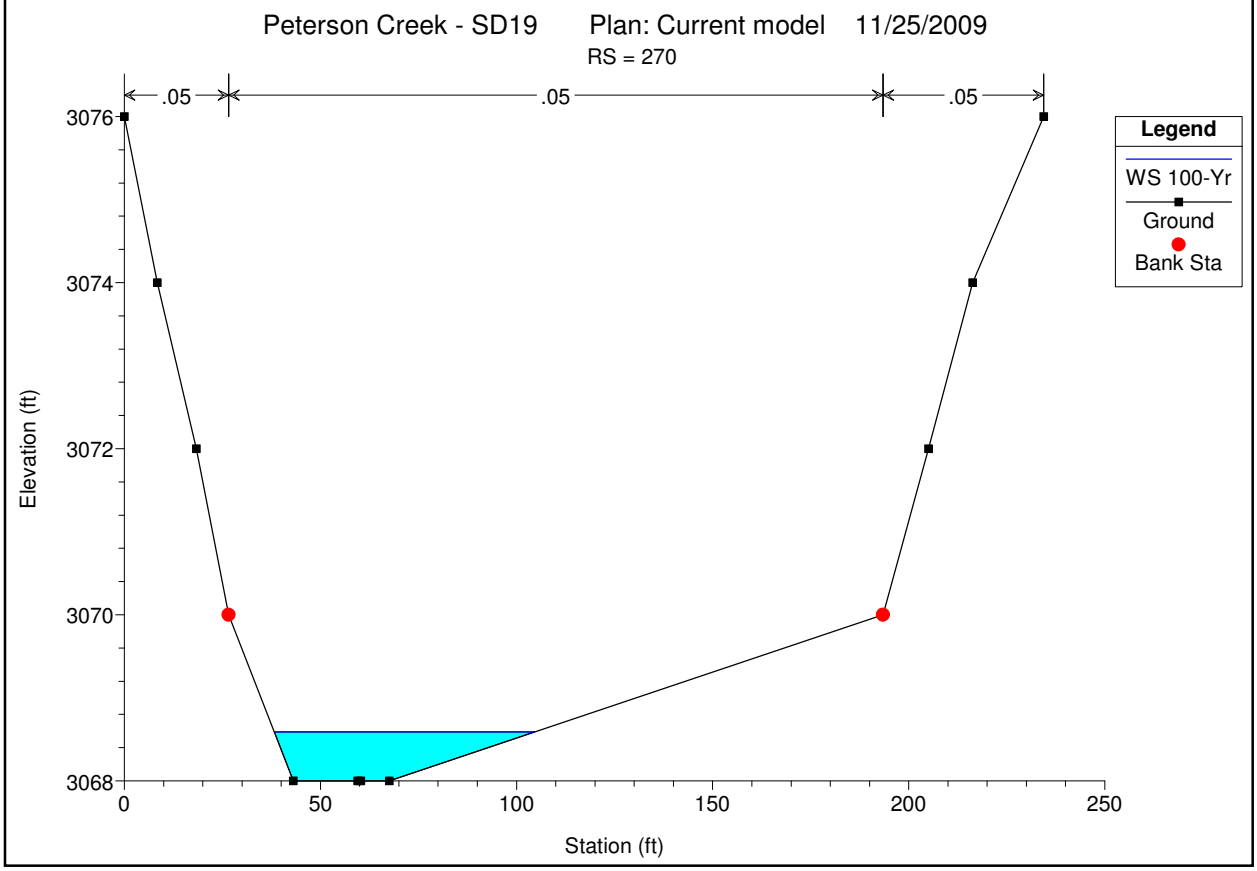
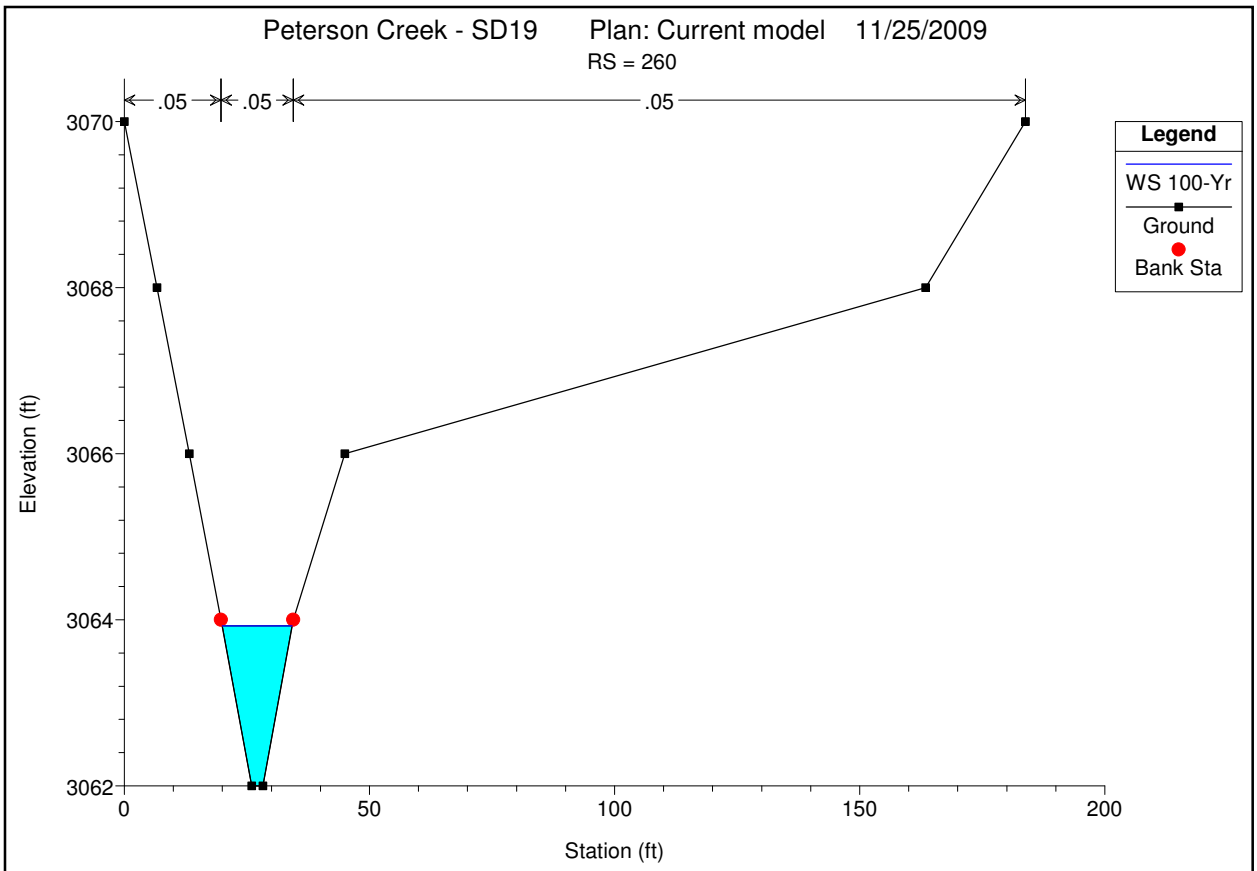
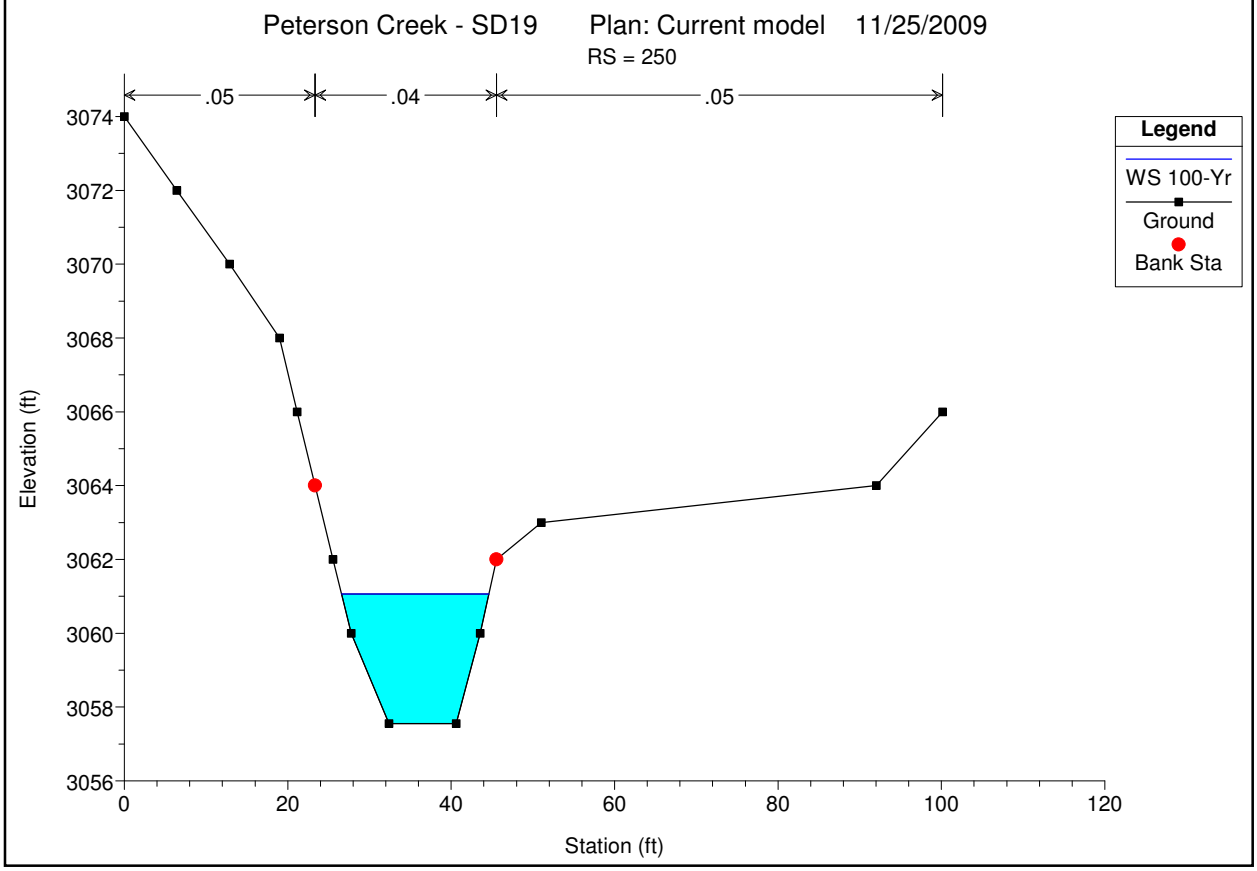
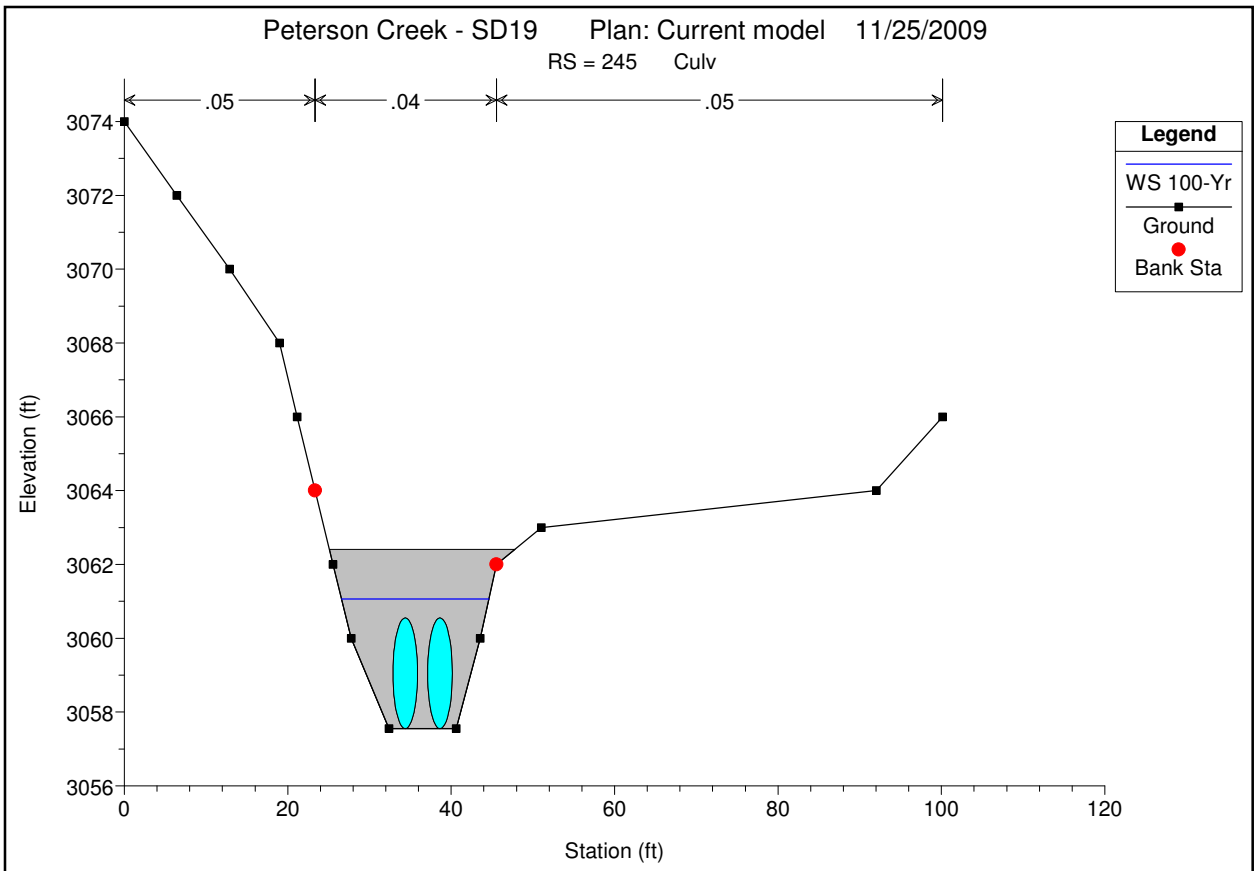
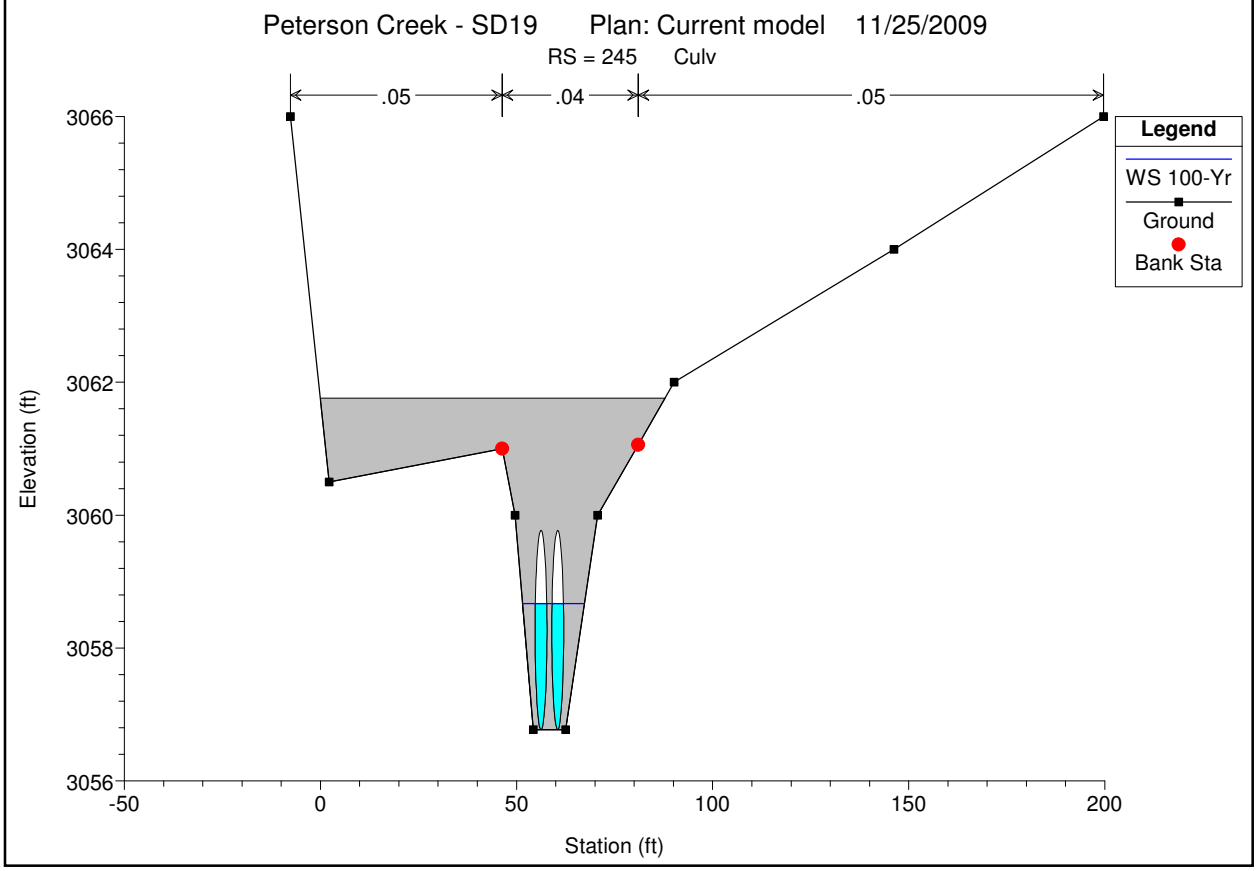
RS = 280
.05
.05
.05
3082
3080
3078
3076
3074
3072
3070
3068
3066
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta

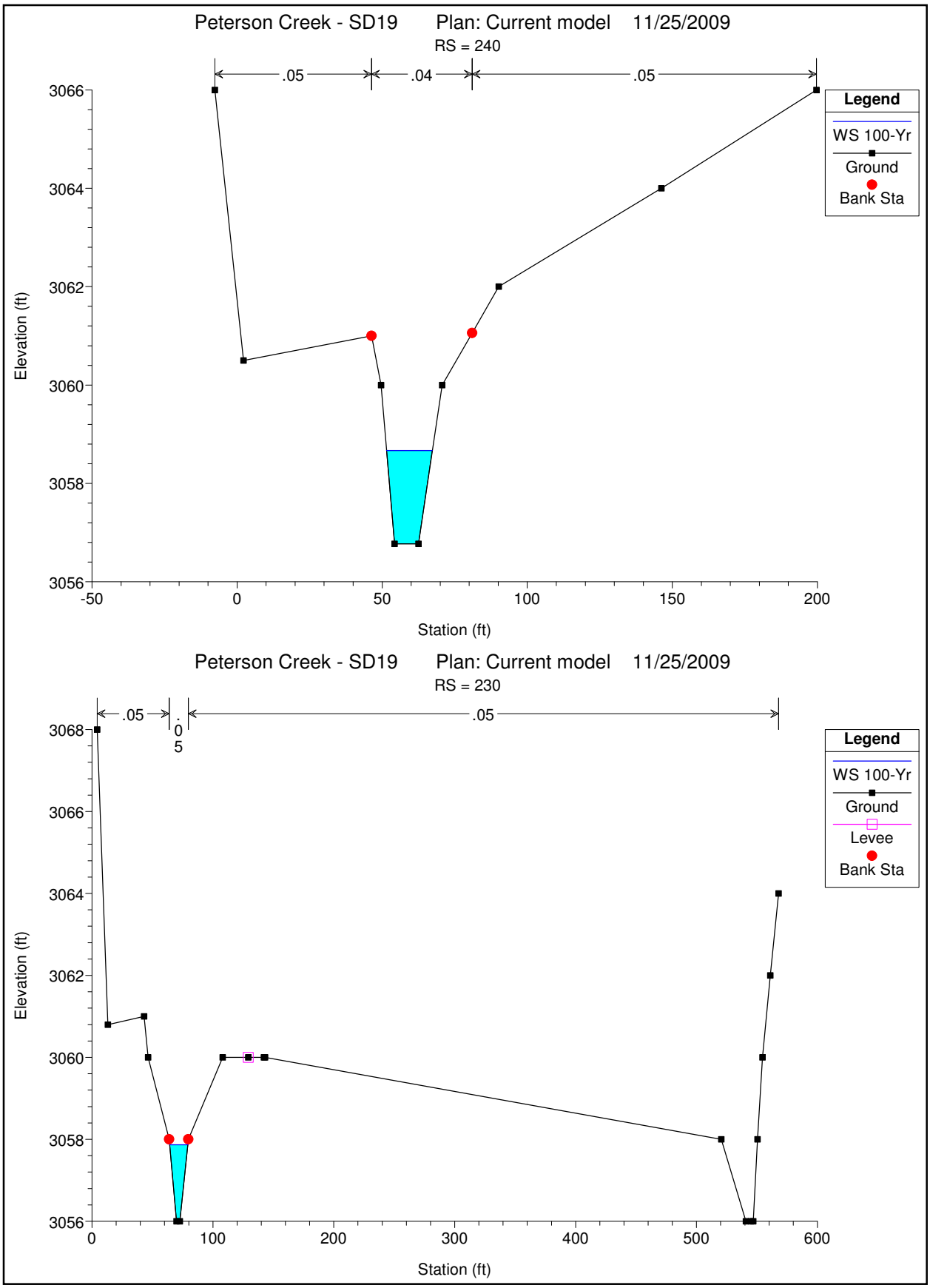

Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 270
.05
.05
.05
3076
3074
3072
3070
3068
Elevation (ft)
0
50
100
150
200
250
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta

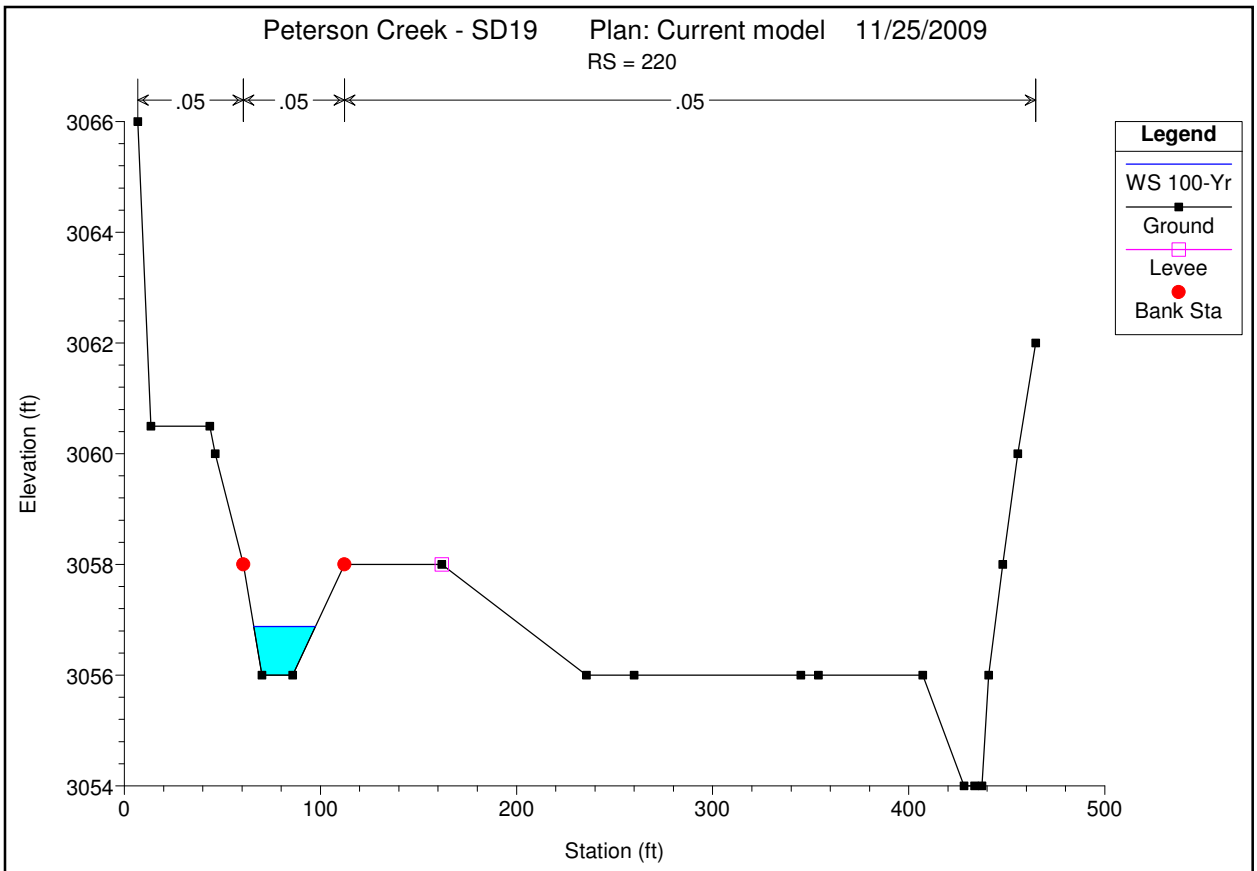

Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 260
.05
.05
.05
3070
3068
3066
3064
3062
Elevation (ft)
0
50
100
150
200
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta

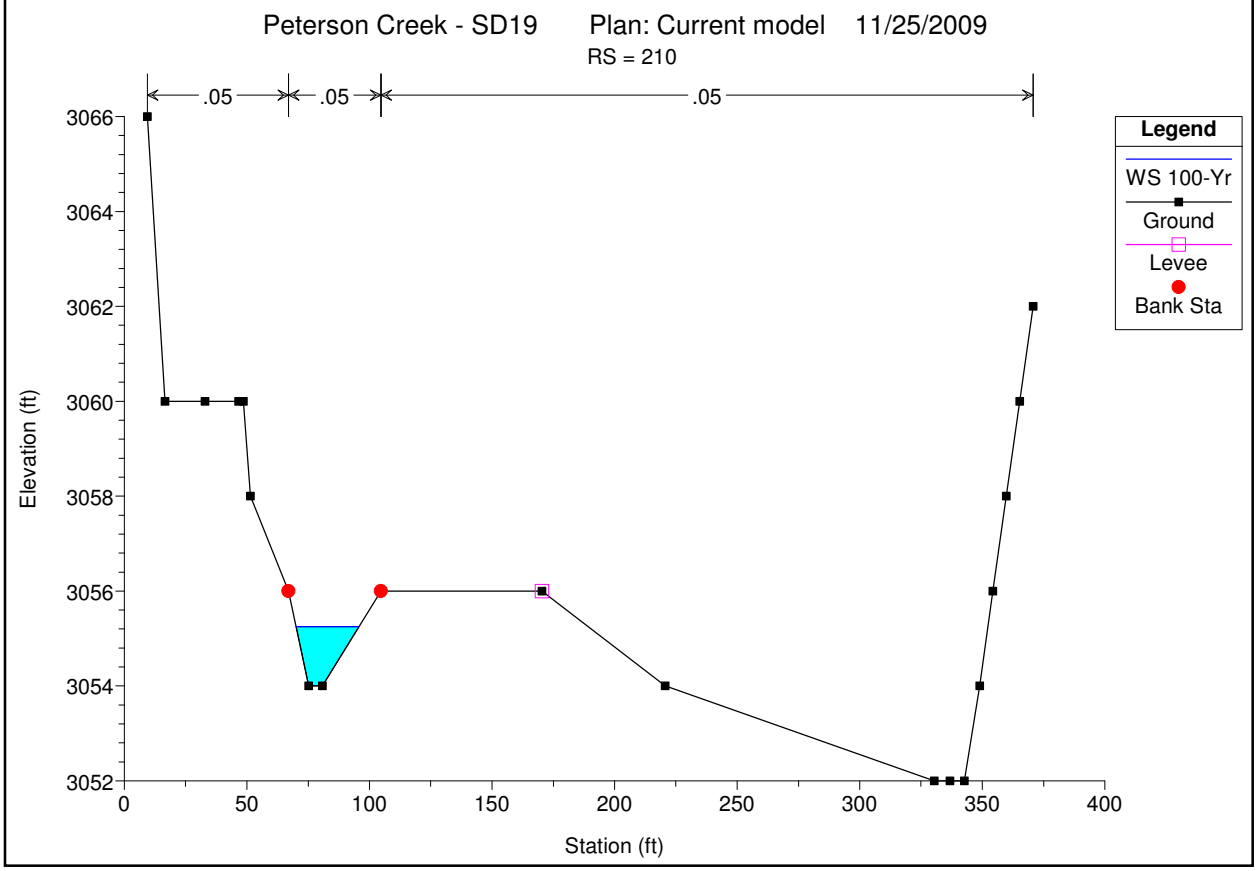

Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 250
.05
.04
.05
3074
3072
3070
3068
3066
3064
3062
3060
3058
3056
Elevation (ft)
0
20
40
60
80
100
120
Station (ft)
Legend
WS 100-Yr
Ground
Bank Sta


Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 245 Culv
.05
.04
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
3074
3072
3070
3068
3066
3064
3062
3060
3058
3056
0
20
40
60
80
100
120
Station (ft)


Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 245 Culv
.05
.04
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
3066
3064
3062
3060
3058
3056
-50
0
50
100
150
200
Station (ft)


Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 240
.05
.04
.05
Legend
WS 100-Yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
3066
3064
3062
3060
3058
3056
-50
0
50
100
150
200
Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 230
.05
.05
Legend
WS 100-Yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
3068
3066
3064
3062
3060
3058
3056
0
100
200
300
400
500
600


Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 220
.05
.05
.05
Legend
WS 100-Yr
Ground
Levee
Bank Sta
Elevation (ft)
3066
3064
3062
3060
3058
3056
3054
0
100
200
300
400
500
Station (ft)


Peterson Creek - SD19 Plan: Current model 11/25/2009
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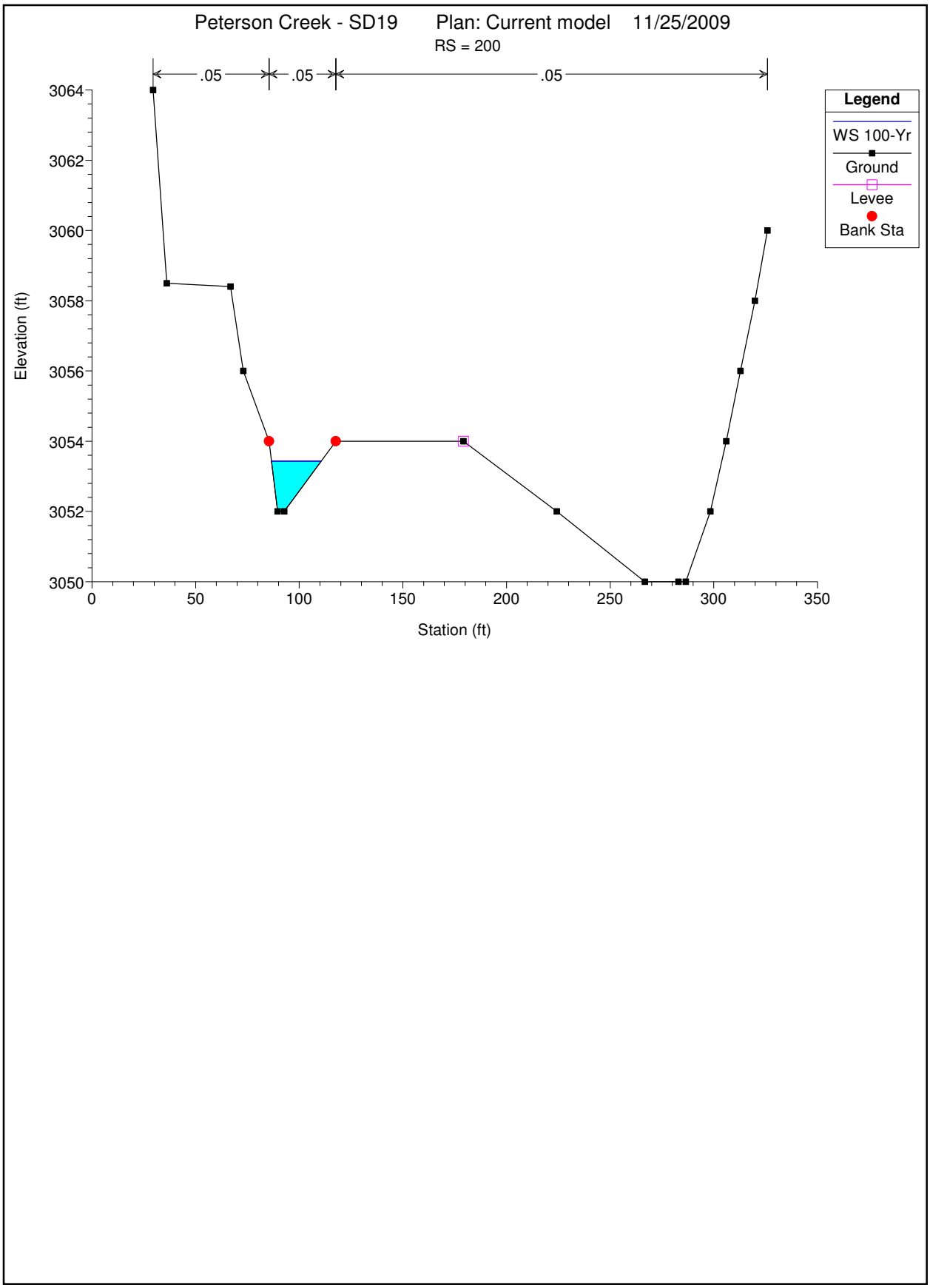
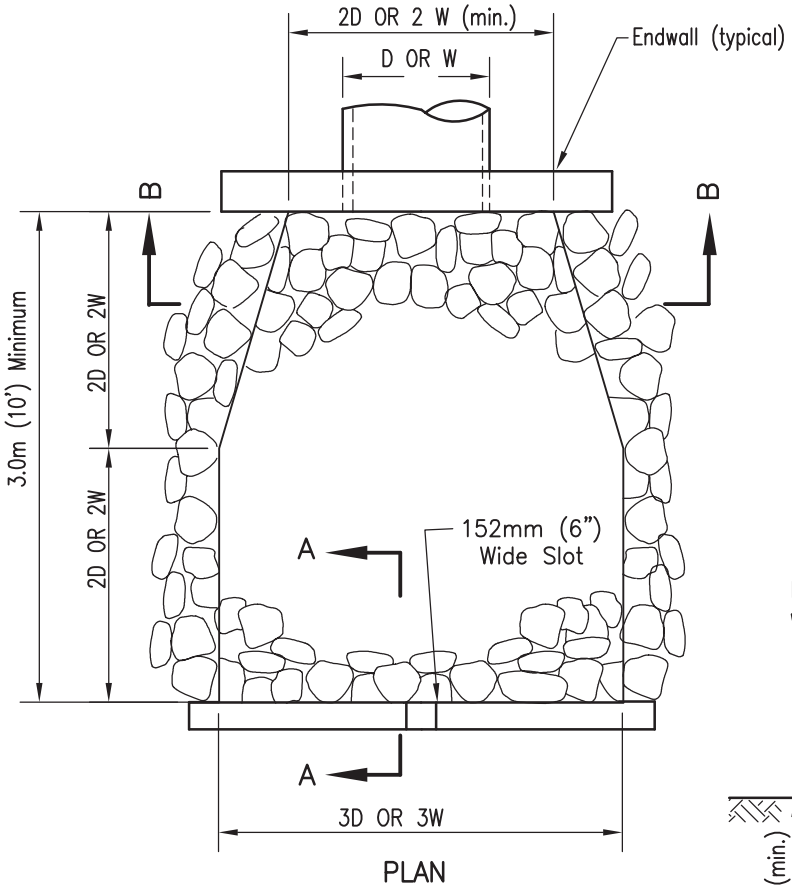
.05
.05
.05
Legend
WS 100-Yr
Ground
Levee
Bank Sta
Elevation (ft)
3066
3064
3062
3060
3058
3056
3054
3052
0
50
100
150
200
250
300
350
400
Station (ft)


Peterson Creek - SD19 Plan: Current model 11/25/2009
RS = 200
.05
.05
.05
Legend
WS 100-Yr
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
3064
3062
3060
3058
3056
3054
3052
3050
0
50
100
150
200
250
300
350

HEC-RAS Plan: SDB039600 River: River #1 Reach: Reach #1 Profile: 100-Yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach #1	300	100-Yr	96.21	3070.00	3071.31	3071.28	3071.78	0.035277	5.48	17.54	17.61	0.97
Reach #1	290	100-Yr	96.21	3068.00	3069.75	3069.75	3070.33	0.037476	6.11	15.76	13.77	1.01
Reach #1	280	100-Yr	96.21	3066.00	3069.05		3069.15	0.003145	2.42	39.79	21.67	0.31
Reach #1	270	100-Yr	96.21	3068.00	3068.59	3068.59	3068.79	0.049409	3.60	26.72	66.35	1.00
Reach #1	260	100-Yr	96.21	3062.00	3063.93	3063.93	3064.49	0.037402	6.03	15.97	14.26	1.00
Reach #1	250	100-Yr	96.21	3057.55	3061.07	3059.01	3061.13	0.000962	2.02	47.52	18.04	0.22
Reach #1	245		Culvert									
Reach #1	240	100-Yr	96.21	3056.77	3058.67		3058.94	0.008564	4.22	22.77	15.76	0.62
Reach #1	230	100-Yr	96.21	3056.00	3057.87	3057.84	3058.39	0.035310	5.82	16.52	14.95	0.98
Reach #1	220	100-Yr	96.21	3056.00	3056.88	3056.88	3057.21	0.042717	4.64	20.73	31.45	1.01
Reach #1	210	100-Yr	96.21	3054.00	3055.25	3055.25	3055.63	0.039532	4.91	19.60	25.69	0.99
Reach #1	200	100-Yr	96.21	3052.00	3053.44	3053.42	3053.81	0.037209	4.94	19.48	23.97	0.97

CULVERT AND RIPRAP SIZING SUMMARY TABLE



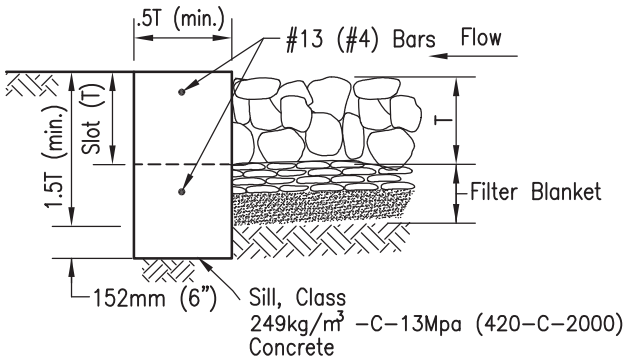
PLAN

Design Velocity m/sec (ft/sec)*	Rock Classification	T (min)
1.8–3 (6–10)	No. 2 Backing	320mm (1.1ft)
3–3.7 (10–12)	220 kg (1/4 ton)	823mm (2.7ft)
3.7–4.3 (12–14)	450 kg (1/2 ton)	1.1m (3.5ft)
4.3–4.9 (14–16)	900 kg (1 ton)	1.3m (4.4ft)
4.9–5.5 (16–18)	1.8 tonne (2 ton)	1.6m (5.4ft)

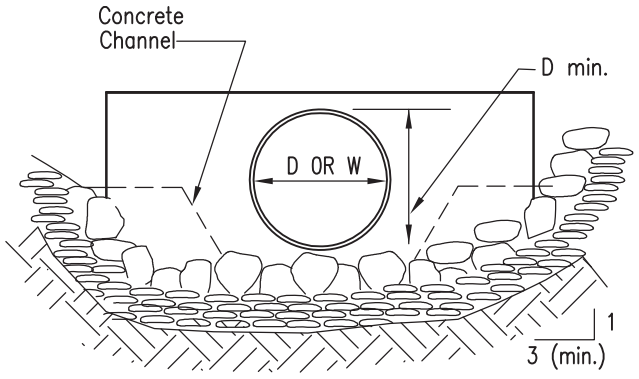
*over 5.5 mps (18 fps) requires special design

D = Pipe Diameter

W = Bottom Width of Channel



SECTION A–A



SECTION B–B

NOTES

1. Plans shall specify:
   A) Rock Class and thickness (T).
   B) Filter material, number of layers and thickness.
2. Rip rap shall be either quarry stone or broken concrete (if shown on the plans.) Cobbles are not acceptable.
3. Rip rap shall be placed over filter blanket which may be either granular material or filter fabric (woven filter slit film fabric shall not be used).
4. See Regional Supplement Amendments for selection of filter blanket.
5. Rip rap energy dissipators shall be designated as either Type 1 or Type 2. Type 1 shall be with concrete sill; Type 2 shall be without sill.

Revision	By	Approved	Date
ORIGINAL		Kercheval	12/75
Add Metric		T. Stanton	03/03
Add Rip Rap Table		S. Brady	04/06
Edited		T. Stanton	02/09

SAN DIEGO REGIONAL STANDARD DRAWING

RIP RAP ENERGY DISSIPATER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

T. Stanton 04/27/2006

Chairperson R.C.E. 19246 Date

DRAWING NUMBER D–40

August 2009

Culvert and Rip Rap Sizing Summary Table

	SD01	SD02	SD03	SD04	SD05	SD06	SD07	SD08	SD09	SD10	SD11	SD12	SD13	SD14	SD15	SD16	SD17	SD18	SD19	SD20	SD01-P	SD02-P
Culvert Data	**[3]31+32.45**	**[1]33+37.23**	**[1]38+01.54**	**[3]40+34.69**	**N/A**	**[3]56+21.82**	**[2]59+66.37**	**[1]70+82.70**	**[1]73+01.11**	**[2]79+71.02**	**[3]83+06.52**	**[1]86+36.04**	**[2]89+63.56**	**[3]95+06.72**	**[2]101+17.00**	**[2]103+20.95**	**[4]107+36.02**	**[1]115+38.09**	**[1]120+15.30**	**[1]123+23.61**	**[3]12+59.60**	**[3]17+60**
Tributary Area (acres)	8.20	1.50	19.02	22.51	5.41	17.72	4.97	7.70	121.89	0.69	8.43	12.87	5.52	11.26	2.27	1.46	13.81	N/A	N/A	11.71	8.59	19.35
cfs/acre ratio	1.9	N/A	1.9	1.9	2.0	1.9	2.0	N/A	N/A	2.0	1.9	N/A	2.0	1.9	2.0	2.0	1.8	N/A	N/A	N/A	1.9	1.9
Discharge (cfs)	15.58	3.01	36.14	42.77	10.82	33.67	9.94	14.71	139.02	1.38	16.02	23.58	11.04	21.39	4.54	2.92	25.27	443.80	96.21	16.88	16.32	24.40
Quantity of Culverts	1	1	1	2	1	1	1	1	2	1	1	1	1	1	1	1	1	2	2	1	1	1
Diameter (in.)	24	18	30	24	18	30	18	24	42	18	24	24	18	24	18	18	30	NA	36	18	24	30
Diameter (ft.)	2	1.5	2.5	2	1.5	2.5	1.5	2	3.5	1.5	2	2	1.5	2	1.5	1.5	2.5	8x4	3.0	1.5	2	2.5
Velocity (fps)	14.06	10.65	18.30	10.39	13.16	16.93	15.65	10.74	15.63	7.52	11.66	14.71	14.85	13.79	10.13	9.41	14.13	5.18	4.22	19.90	14.95	9.02
Tailwater Depth (ft)	0.54	0.36	0.67	0.63	0.43	0.68	0.41	0.56	1.36	0.34	0.56	0.88	0.42	0.57	0.39	0.37	0.67	5.19	1.9	0.43	0.7	0.75
y_n, Culvert Normal Depth (ft)	0.68	0.29	0.87	1.14	0.63	0.89	0.53	0.80	1.27	0.22	0.79	0.91	0.60	0.85	0.43	0.34	0.84	2.25	1.95	0.66	0.69	1.23
D', Adjusted Culvert Rise (ft)	1.34	0.90	1.69	1.57	1.07	1.70	1.02	1.40	2.39	0.86	1.40	1.46	1.05	1.43	0.97	0.92	1.67	#VALUE!	2.48	1.08	1.35	1.87
D_{50}, Riprap size (ft)	0.97	0.28	1.75	2.58	1.02	1.57	1.02	0.81	3.28	0.11	0.92	0.92	1.08	1.28	0.40	0.25	1.11	#VALUE!	1.37	1.79	0.79	0.82
Edge of Road Elev. (ft)	3147.53	3149.91	3126.58	3126.10	3077.90	3056.82	3079.66	3072.37	3068.18	3095.50	3085.33	3068.78	3056.89	3074.91	3084.96	3083.06	3070.12	3042.16	3062.41	3084.14	3229.24	3190.36
Allowable Headwater Elev.	3146.53	3148.91	3125.58	3125.10	3076.90	3055.82	3078.66	3071.37	3067.18	3094.50	3084.33	3067.78	3055.89	3073.91	3083.96	3082.06	3069.12	3041.16	3061.41	3083.14	3228.24	3189.36
Computed Headwater Elev (ft)	3146.14	3146.86	3125.46	3124.19	3076.90	3055.54	3078.17	3070.13	3066.86	3091.92	3083.23	3067.78	3055.43	3073.67	3082.39	3080.22	3068.20	3037.28	3061.07	3083.13	3228.23	3189.36
Freeboard From Edge of Road (ft)	1.39	3.05	1.12	1.91	1.00	1.28	1.49	2.24	1.32	3.58	2.10	1.00	1.46	1.24	2.57	2.84	1.92	4.88	1.34	1.01	1.01	1.00
Rip Rap Per D-40				T=2.7' 1/2 Ton	N/A				T=4.4 1 Ton	T=1.1 No. 2						T=1.1 No. 2		T=1.1 No. 2	T=1.1 No. 2			T=1.1' No. 2
[5]Rip Rap Per Mod. RSD D-40	T=2.5' Light L=10'	T=1.5' Light L=10'	T=3.7' 1/2 Ton L=20'		N/A	T=3.7' 1/2 Ton L=17.5'	T=2.5' Light L=10'	T=2.0' Light L=10'			T=2.5' Light L=10'	T=2.5' Light L=12'	T=2.5' Light L=10'	T=3.7' 1/2 Ton L=14'	T=1.5' Light L=10'		T=2.5' Light L=15'			T=3.7' 1/2 Ton L=12'	T=2.0' Light L=10'	

(1) Rational Method Analyses used to calculate peak discharge
(2) Peak discharge calculated using 2.0 cfs/acre ratio
(3) Peak discharge calculated using 1.9 cfs/acre ratio
(4) Peak discharge calculated using 1.8 cfs/acre ratio
(5) HEC-14 used to calculate D_{50} for selection of rock class in Modified RSD D-40. Rock classification selection taken from CALTrans Gradation Table 5-1.

APPENDIX C: MAPS & EXHIBITS

Existing Hydrology Map

Proposed Hydrology Map

Proposed Access Road Hydrology Map

Peterson Creek HEC-RAS Exhibits

BERKEBILE
XREFS: *EXTO, EXPN, EXMA, PRPN, 36X48S, PR-HH-MRM, PRUT, PRTO*

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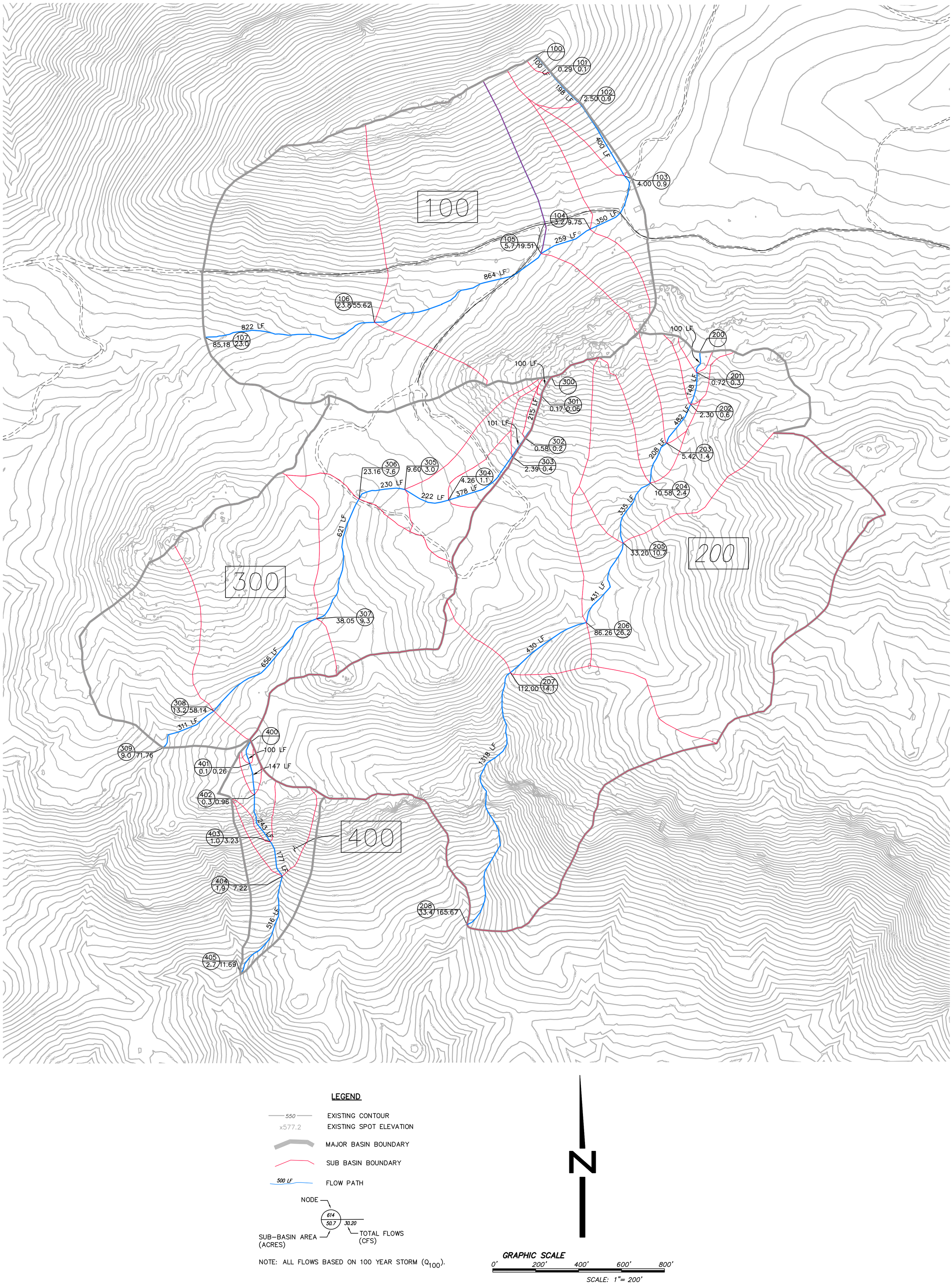


LEGEND

- 550 — EXISTING CONTOUR
- x577.2 — EXISTING SPOT ELEVATION
- MAJOR BASIN BOUNDARY
- SUB BASIN BOUNDARY
- 500 LF — FLOW PATH
- NODE: 614 / 50.7 (SUB-BASIN AREA (ACRES)) / 30.20 (TOTAL FLOWS (CFS))

NOTE: ALL FLOWS BASED ON 100 YEAR STORM (Q_{100}).

N

GRAPHIC SCALE
0' 200' 400' 600' 800'
SCALE: 1"= 200'

JOB NUMBER SDB039600
SCALE VERTICAL: 1"= N/A HORIZONTAL: 1"= 200'
SHEET NUMBER 1 OF 1 SHEETS

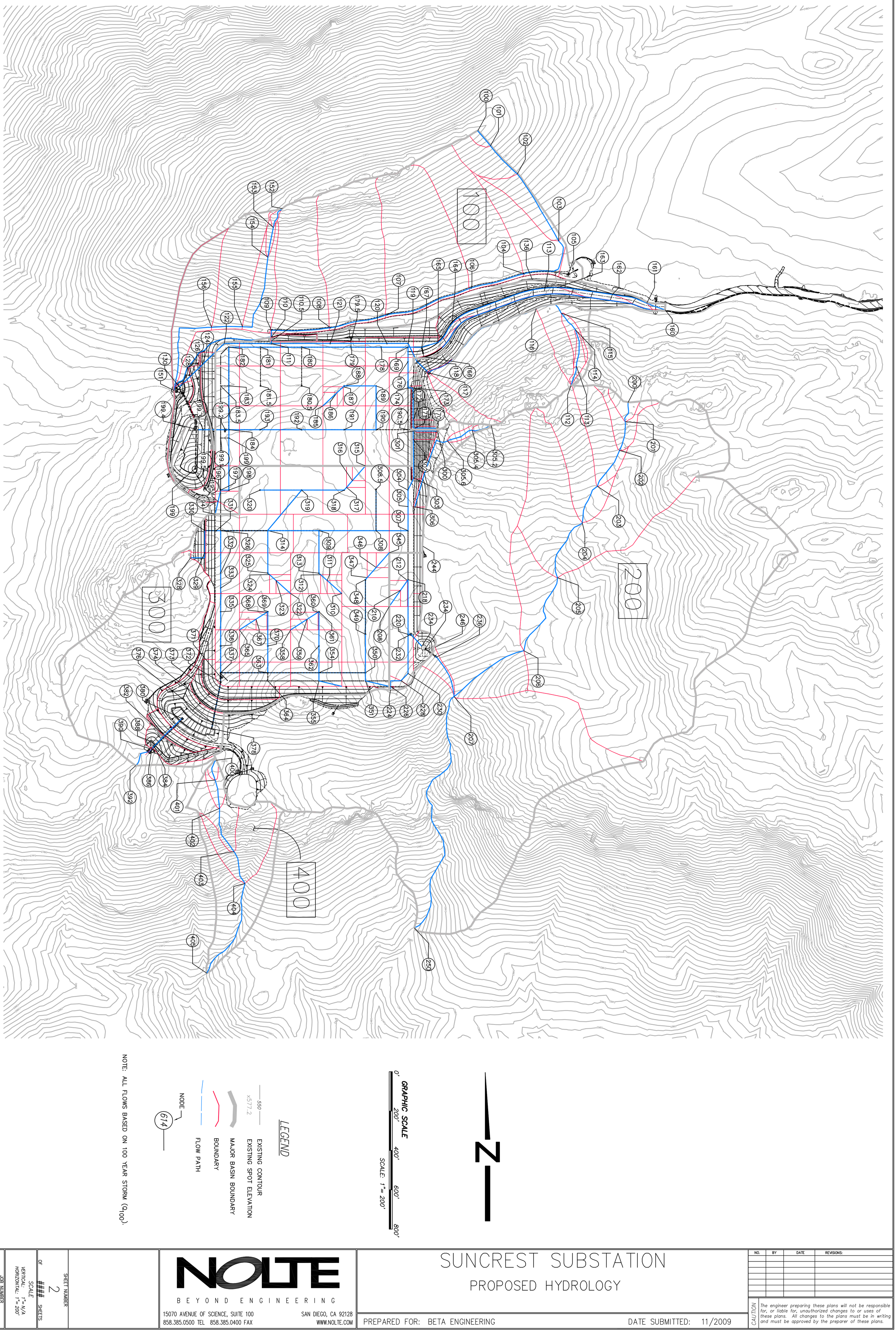
NOLTE BEYOND ENGINEERING
15070 AVENUE OF SCIENCE, SUITE 100 SAN DIEGO, CA 92128
858.385.0500 TEL 858.385.0400 FAX WWW.NOLTE.COM

SUNCREST SUBSTATION

EXISTING HYDROLOGY

PREPARED FOR: BETA ENGINEERING DATE SUBMITTED: 11/2009

NO.	BY	DATE	REVISIONS:



NOTE: ALL FLOWS BASED ON 100 YEAR STORM (Q_{100}).

LEGEND

- 550 — EXISTING CONTOUR
- x577.2 EXISTING SPOT ELEVATION
- MAJOR BASIN BOUNDARY
- BOUNDARY
- FLOW PATH
- NODE 614

GRAPHIC SCALE
0' 200' 400' 600' 800'
SCALE: 1"= 200'

N

SUNCREST SUBSTATION

PROPOSED HYDROLOGY

PREPARED FOR: BETA ENGINEERING

DATE SUBMITTED: 11/2009

NO.	BY	DATE	REVISIONS:

CAUTION: *The engineer preparing these plans will not be responsible for, or liable for, unauthorized changes to or uses of these plans. All changes to the plans must be in writing and must be approved by the preparer of these plans.*

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SHEET NUMBER 2 OF #### SHEETS

SCALE
VERTICAL: 1"= N/A
HORIZONTAL: 1"= 200'

JOB NUMBER SDB039600

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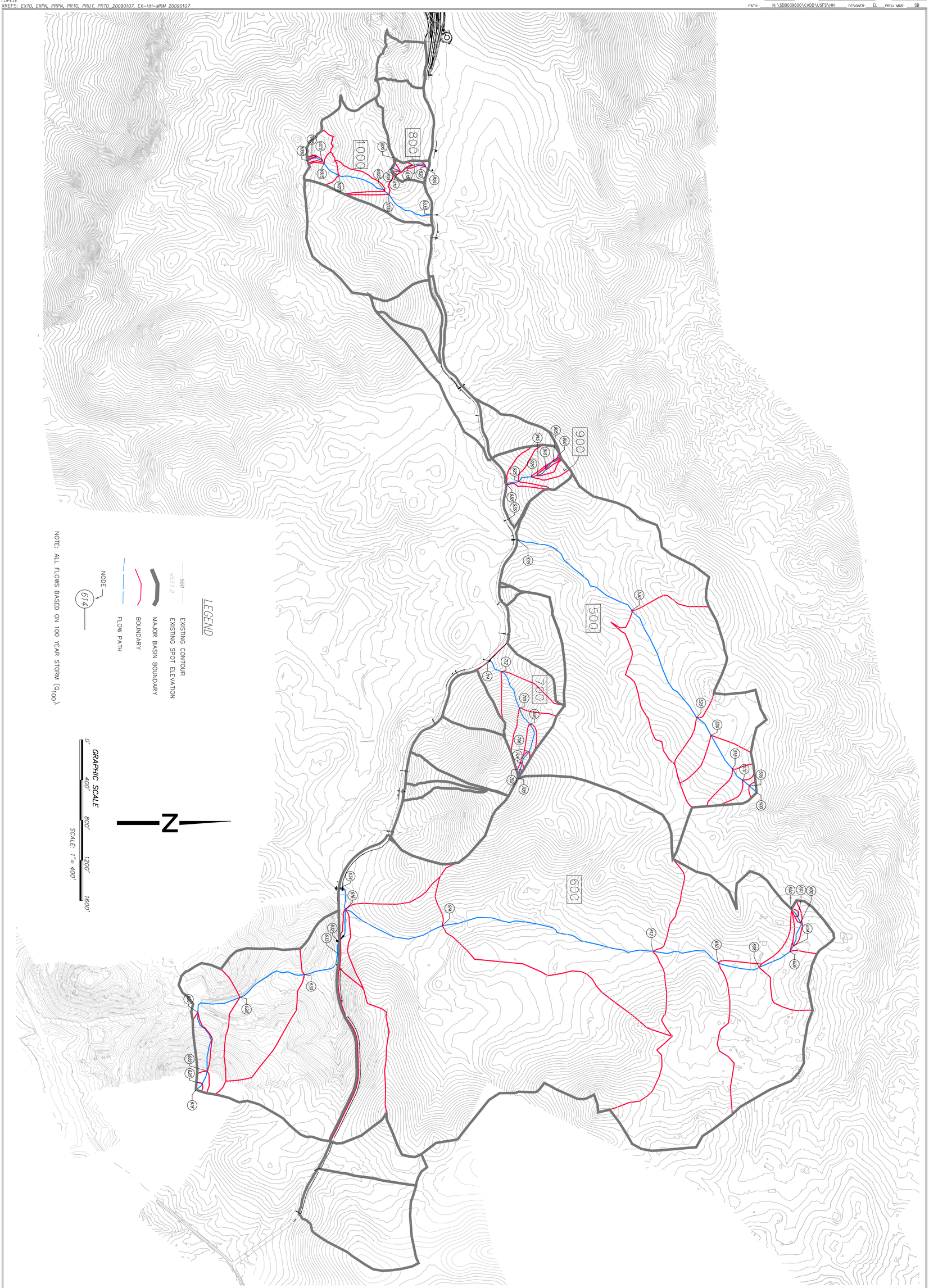

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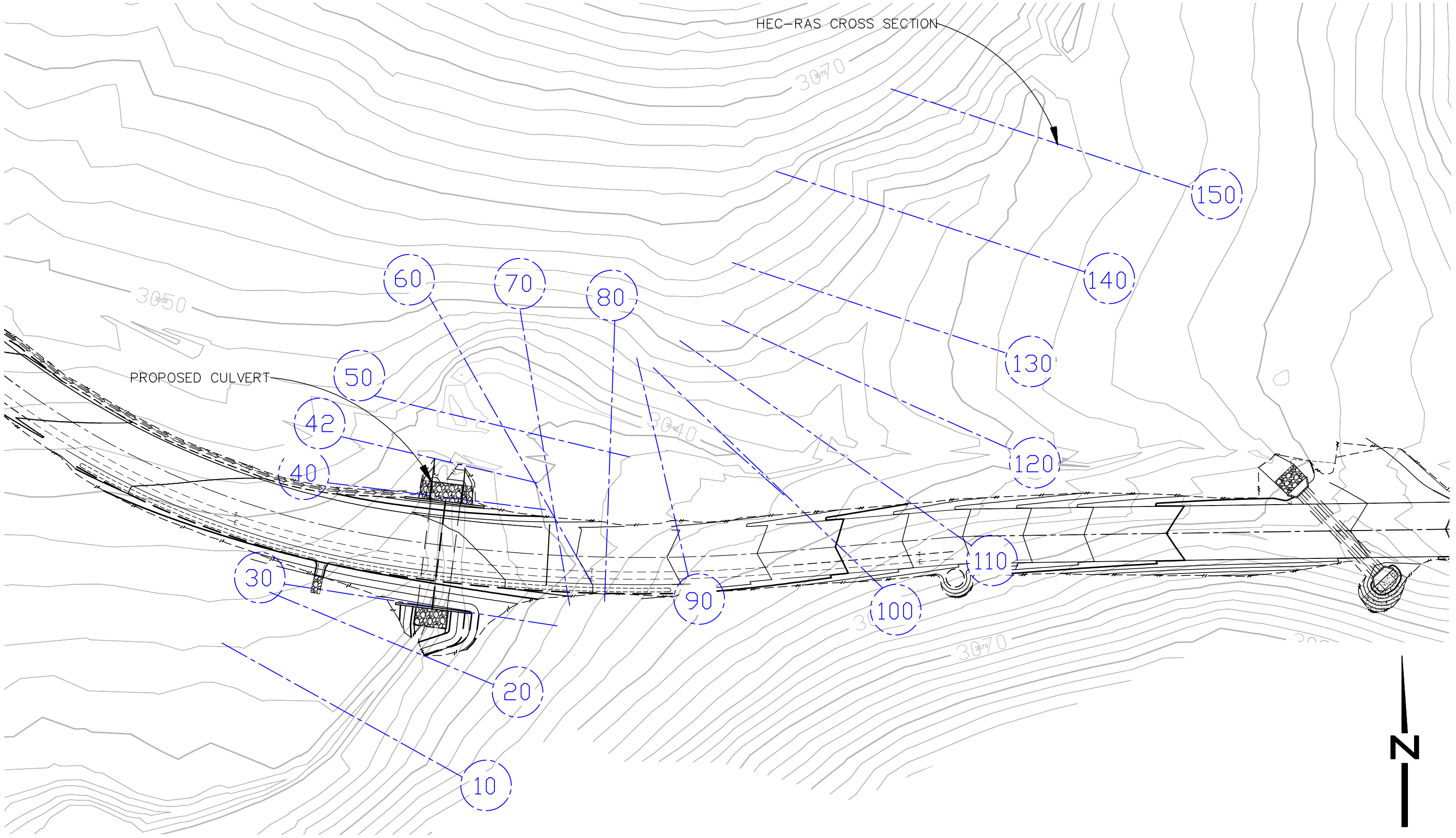
SUNCREST SUBSTATION

PROPOSED ACCESS ROAD HYDROLOGY

PREPARED FOR: BETA ENGINEERING DATE SUBMITTED: 11/2009

NO.	BY	DATE	REVISIONS:

JOB NUMBER SDB039600
SCALE VERTICAL: 1" = N/A HORIZONTAL: 1" = 400'
SHEETS 1 OF ####
SHEET NUMBER



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SUNCREST SUBSTATION
PETERSON CREEK
HEC-RAS ANALYSIS - SD18

PREPARED FOR: BETA ENGINEERING
DATE SUBMITTED: 11/2009

SHEET NUMBER 1 OF 2 SHEETS
JOB NUMBER SDB039600

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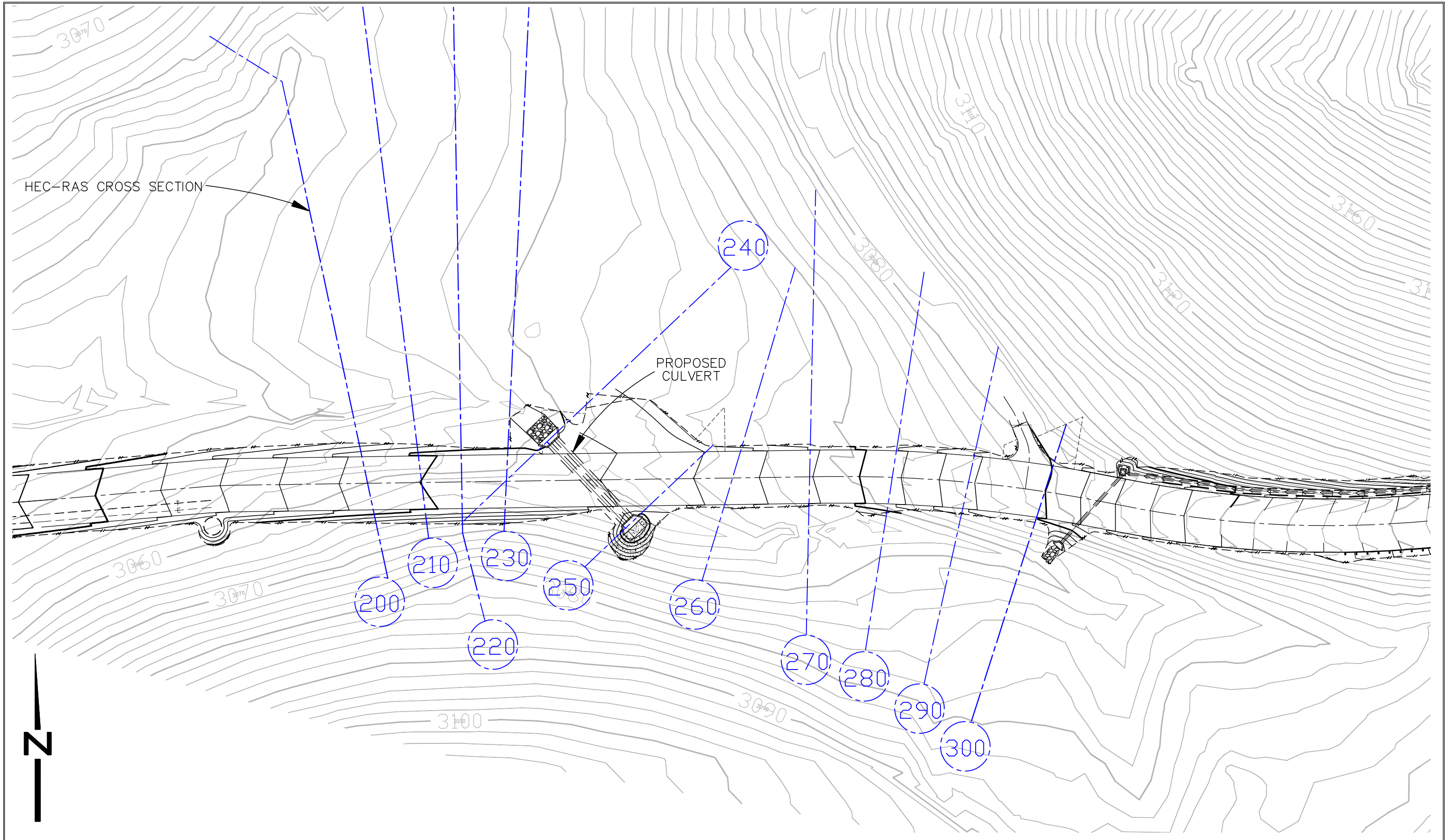

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BERKEBILE XREFS:

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SUNCREST SUBSTATION
PETERSON CREEK
HEC-RAS ANALYSIS – SD19

PREPARED FOR: BETA ENGINEERING DATE SUBMITTED: 11/2009

SHEET NUMBER 2 OF 2 SHEETS
JOB NUMBER SDB039600