Snipes-Dye associates

CEQA PRELIMINARY

HYDROLOGY/DRAINAGE STUDY

SPIRIT OF JOY LUTHERAN CHURCH MUP

3300 P08-017; 3910 08-09-005

County of San Diego

DATED: February 4, 2008
REVISED: June 24, 2009, September 27, 2010, January 21, 2011
September 5, 2012

Prepared By:
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RA0272

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HYDROLOGY AND HYDRAULIC CALCULATIONS FOR THE SPIRIT OF JOY LUTHERAN CHURCH - MUP

The proposed project is a Major Use Permit for the construction of a church with associated facilities. Proposed development will occur on the north corner of Highland Valley Road and Highway 67 (Julian Road). The site is currently vacant land and appears to have been never developed. The site is adjacent to Highway 67 and Highland Valley Road, but will not take access from either of these streets. Access to the site will come from Highland Valley Court to the west of the site.

The site is currently in a mostly natural condition with the runoff mostly sheet flowing westerly through the site where it then concentrates to two points prior to discharging into the vacant property westerly of the site. The development of the site will include four buildings, associated parking and a scaled down ball field. Off-site drainage from the east and south under Highway 67 and Highland Valley Road, respectively, were included within the following calculations. There is an existing 7' x 1.5' box culvert under Highland Valley Road that will need to be extended to accommodate the widening of said road. Also along Highland Valley Road at the westerly end of the site there is a curb inlet being proposed to collect runoff from the road after proposed road widening. The curb inlet will discharge into the proposed drainage swale at the south end of the site through an 18" RCP pipe.

Roof drains from the buildings will discharge to grade adjacent to the buildings and be routed through the proposed landscaping before they reach the proposed swale to the south or catch basins within the parking lot areas. The pre-development drainage system consists of two basins as shown on the attached drainage map. Both basins eventually merge to the west of the subject property prior to them flowing under Highland Valley Court through two 36" RCP culverts. The drainage analysis extends to the downstream end of the culverts to get a comparison of flow volume and velocity at one common point from the pre-development to post-development. The post-development drainage system consists of the identical system also as shown on the attached drainage map. The post-development drainage simulates the pre-development drainage to the maximum extent practical. With points of discharge being at identical points (two locations) in both the pre and post development conditions there is no change in discharge with the development of the site.

Calculations were prepared to adequately analyze the hydraulics of the proposed storm drainage system for the developed site. The analysis was prepared for the 100-year and 10-year six-hour storm events. Storm drains are sized in accordance with County standards for the calculated 100-year peak flows. The lines of inundation subject to the 100-year flood are shown on the post development drainage map for the drainage basins greater than 25 acres. This area of inundation is limited to the relocated channel. The catch basins in the parking lots and landscape areas at the entrance have been designed to restrict the outflow and pond runoff to retain the increase in runoff due to the development of the site.

As previously stated runoff from the site flows through two 36" RCP pipes under Highland Valley Court where it then merges with a larger basin from the south; from here the runoff flows north where it ultimately merges with Etcheverry Creek before it reaches

Santa Maria Creek. The proposed development of the site will not impact the capacity of the existing storm drain system as they are adequately sized to accept the runoff from the development of the sites in the 100-year storm. As can be seen from the attached calculations and preliminary grading plan the velocities with the development of the site are less than the pre-development conditions at the point of discharge along the westerly boundary of the site. The development also proposes the installation of rock rip-rap energy dissipators at the discharge points of all culverts and at select intervals in the proposed channel to act as rock check dams to minimize velocities. There is a very minor increase in velocity in the two 36" RCP pipes with the development of the site, but the increase is approximately 1% and is considered insignificant. This very minor increase will not cause any additional erosion or scour to the off-site properties downstream of these pipes. The summary at the end of this section shows the velocities for the pre and post development conditions for the pipes.

There is another development being proposed west of Highland Valley Court on both sides of Highland Valley Road. This project, TM5344 is for the development of 125 single-family homes on 682.6 acres. According to the drainage study prepared for the project there is approximately 1680 cfs in the 100-year storm flowing under Highland Valley Road where it confluences with the flow from under Highland Valley Court.

There is no mitigation requirements needed due to the development of the site.

An analysis of the current drainage conditions during the 100-year and 10 year six-hour storm events are also included. Similarly configured basins were analyzed for the developed condition. In preparing this analysis, weighted runoff coefficients were determined to simulate the impact of the development on the peak discharge of each basin. For both the pre-development and post-development conditions soil type D was assumed. Attached is a current soil map as available from the County of San Diego. From the soil map it is difficult to determine the actual soil type as the site falls directly on top of a highway symbol, which blocks the display of the soil type. It appears that the soil type may possibly be a B. If this is the case then the following calculations present a more conservative nature than what may possibly exist. The differential between pre and post would also be less as well, but for the purposes of the study we will continue to assume a soil type D.

For the developed condition of the site four different runoff coefficients were selected for each individual catchment within each sub-basin. The runoff coefficients were selected from Table 3-1 of the County Hydrology Manual attached herein. The following are the "C" values for each catchment:

0.35 – This value was utilized for areas that had less than 10% impervious surfaces and soil type D. For soil type B this would include up to 15% impervious surfaces. This scenario was utilized for the large lawns areas on the south side of the project.

0.46 – This value was utilized for areas than had approximately 20% impervious surfaces and soil type D. For soil type B this would include up to 32% impervious surfaces. This scenario was utilized for the large lawns areas and portions of parking lot at the center of the project.

0.52 – This value was utilized for areas that had approximately 30% impervious surfaces and soil type D. For soil type B this would include up to 41% impervious surfaces. This scenario was utilized for the large lawn area and building rooftops at the southwest side of the project.

0.63 – This value was utilized for areas that had approximately 50% impervious surfaces and soil type D. For soil type B this would include up to 58% impervious surfaces. This scenario was utilized for the majority of the planters and parking lot. These parking lots and planters having a slope across them that is approximately 1%, which has an effect on the "C" value to be chosen.

In comparing the different weighted runoff coefficient values in the pre- and post-development sites, the onsite volume is increased approximately 6 cfs in the 10-year storm and 10 cfs in the 100-year storm.

Since the post-development site is a relatively small tributary area in comparing to the upstream drainage basin, the increase on-site flows does not significantly change the peak outflow of the basin to the downstream property.

Following is the peak outflow comparison table between the pre-development and post-development conditions for the total project *:

TOTAL

	10 Year	**100 Year**
	Q	Q
Pre-Development	81.64	136.27
Post-Development	82.58	136.58

Q is peak flow for 6-hour event in cubic feet per second.

*The above runoff volumes are calculated without any on-site retention. Retention shall occur at Nodes 23, 24, 30, 27, 33 and 36 to mitigate the additional runoff due to development and the introduction of impervious surfaces. See "Retention" section in report for calculations at each of these nodes. The outflow from each catch basin shall be restricted utilizing a 3" pipe, thus creating ponding at each location. The limits of the ponding are shown of the post-development drainage map. The retention calculations show that there will not be a net increase in runoff with the development of the site.

Cross-sections of the on-site channel with water surface elevations at select locations are included in this report.

Calculations were prepared utilizing AES Hydrology software, the San Diego County Hydrology Manual and Hydraflow retention design software.

The attached site drainage map of the conceptual grading plan clearly indicates and details the proposed drainage facilities for the developed site. Offsite drainage basins and current basins were delineated utilizing the only available topographic maps provided by the County of San Diego.

The following table is a summary of the runoff for the 10-year and 100-year storm at each outfall location for pre-development and post-development to provide a comparison:

SNIPES-DYE ASSOCIATES

JOB NO.: RA0272
REVISED: 09/05/12
CALC. BY: WAS

SPIRIT OF JOY LUTHERAN CHURCH
HYDROLOGY SUMMARY

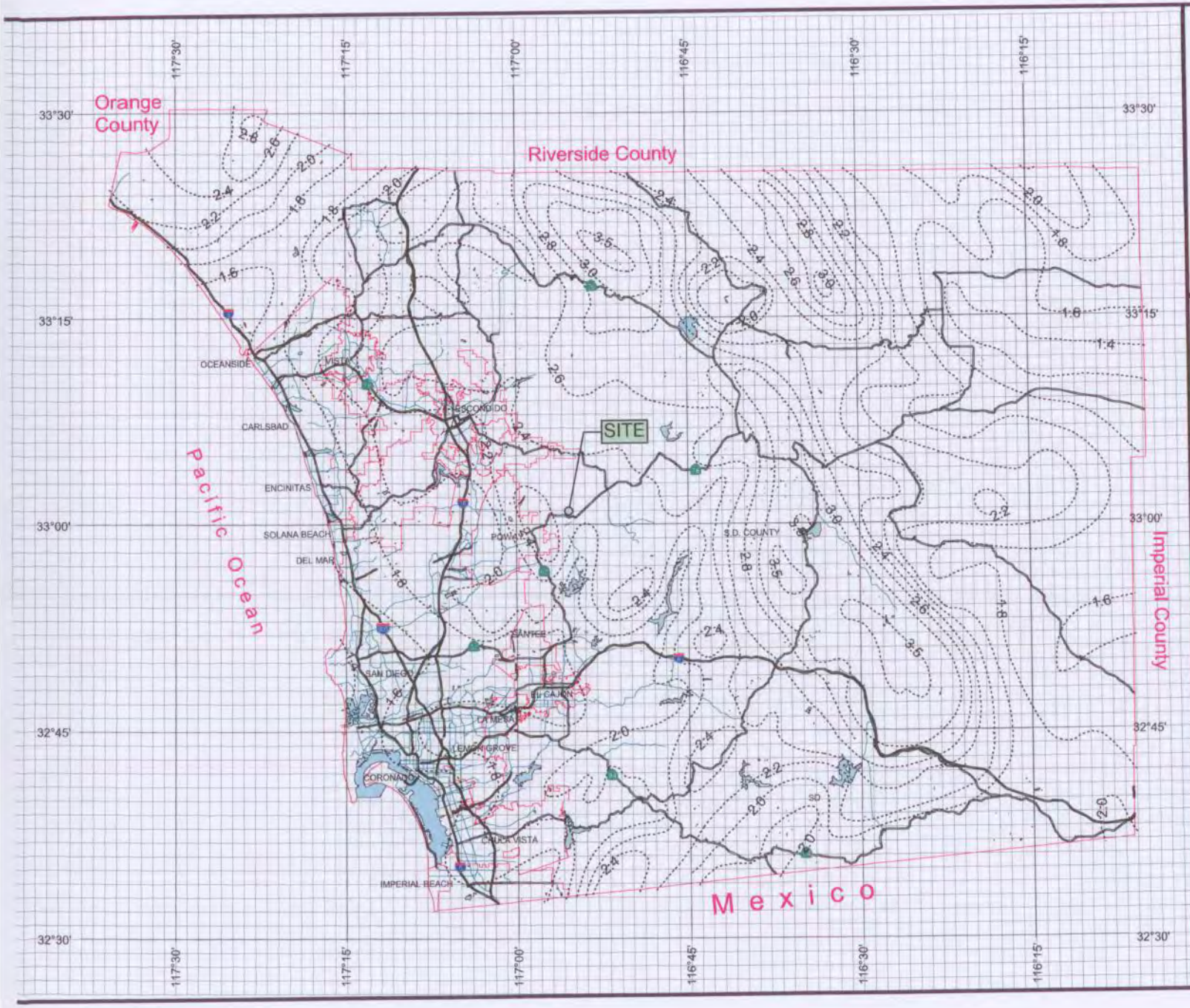
10-YR FREQUENCY

BASIN	PRE-DEVELOPMENT AREA (ac.)	Q (cfs)	V (fps)	POST-DEVELOPMENT AREA (ac.)	Q (cfs)	V (fps)
AA (IN)	19.83	16.22	9.18	19.83	16.22	9.18
BB (IN)	81.06	62.82	13.46	81.06	62.82	11.69
CC (OUT)	109.49	79.60	4.53	84.41	63.83	4.01
DD (OUT)	2.47	2.30	2.13	27.55	22.39	1.53
EE (OUT)	113.73	81.64	13.80	113.73	*82.58	13.84
TOTAL (EE)	**113.73**	**81.64**	**13.80**	**113.73**	***77.96**	**13.84**

100-YR FREQUENCY

BASIN	PRE-DEVELOPMENT AREA (ac.)	Q (cfs)	V (fps)	POST-DEVELOPMENT AREA (ac.)	Q (cfs)	V (fps)
AA (IN)	19.83	26.92	15.23	19.83	26.92	15.23
BB (IN)	81.06	104.02	16.05	81.06	104.02	13.88
CC (OUT)	109.49	132.85	5.10	84.41	105.70	4.61
DD (OUT)	2.47	3.75	2.35	27.55	*37.18	1.81
EE (OUT)	113.73	136.27	15.66	113.73	*136.58	15.67
TOTAL (EE)	**113.73**	**136.27**	**15.66**	**113.73**	***126.75**	**15.67**

* THESE RUNOFF VOLUMES ARE WITHOUT ANY ON-SITE RETENTION. RETENTION SHALL OCCUR AT NODES 23, 24, 30, 27, 33 AND 36 TO MITIGATE THE ADDITIONAL RUNOFF DUE TO DEVELOPMENT AND THE INTRODUCTION OF IMPERVIOUS SURFACES. SEE RETENTION SECTION IN REPORT FOR CALCULATIONS AT EACH OF THESE NODES. THE OUTFLOW FROM EACH CATCH BASIN SHALL BE RESTRICTED UTILIZING A 4" PIPE, THUS CREATING PONDING AT EACH LOCATION.



County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

$P_6 = 2.2$

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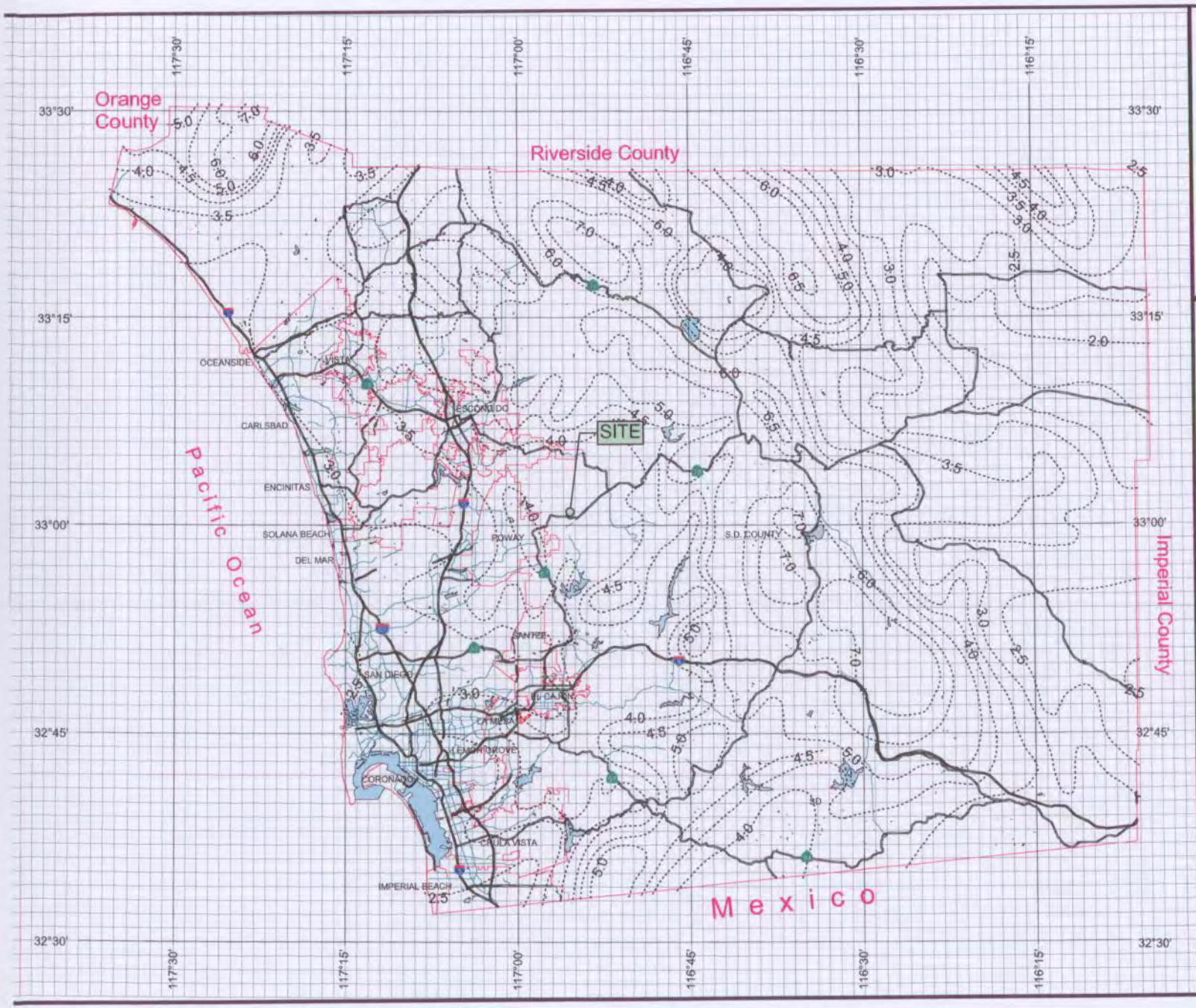

County of San Diego Hydrology Manual

Rainfall Isopluvials

10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

$P_{24} = 4.0$

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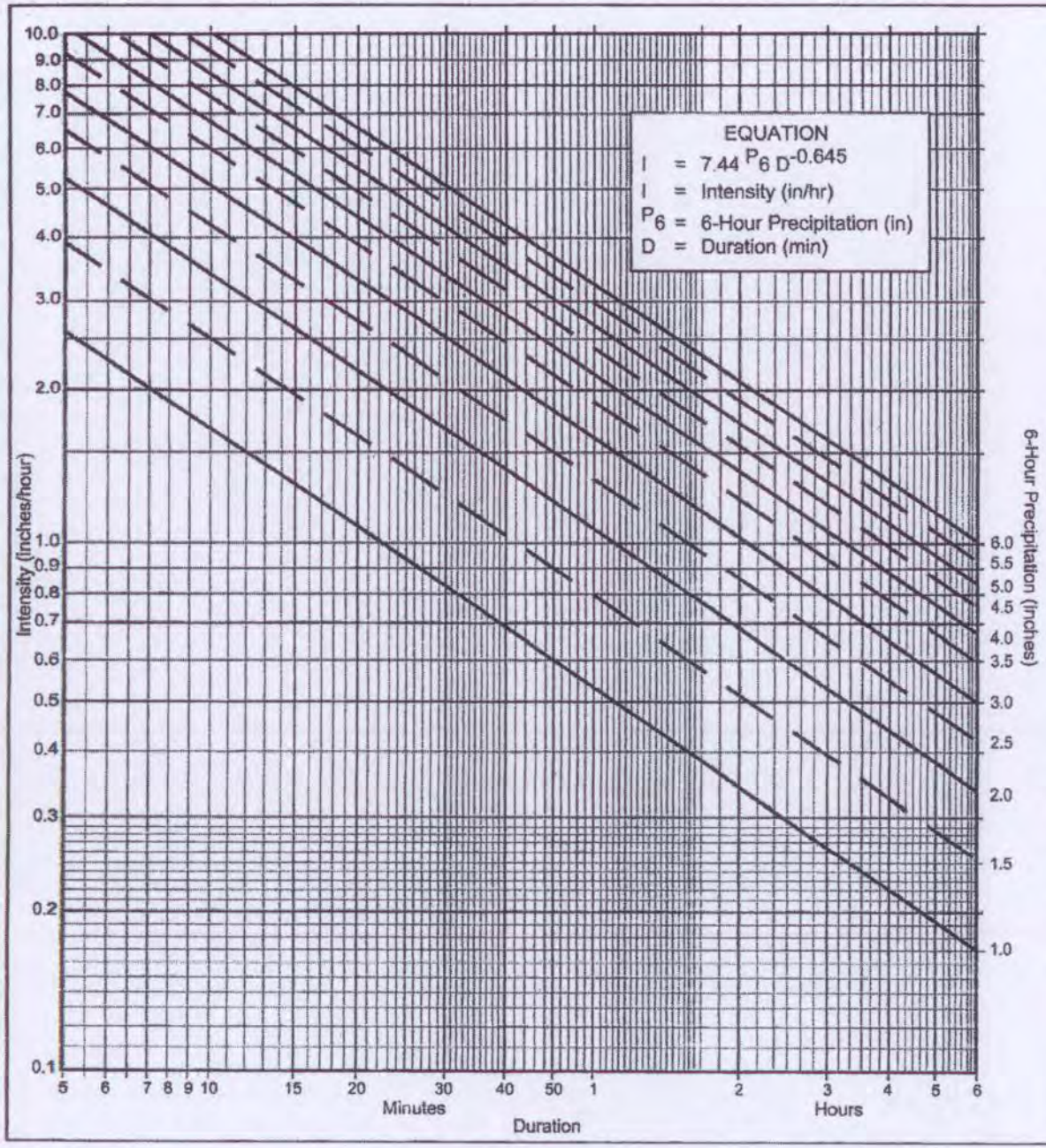


Directions for Application:

(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 10 year

(b) P_6 = 2.2 in., P_{24} = 4.0 , $\frac{P_6}{P_{24}}$ = 55 %(2)

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

(d) t_x = _____ min.

(e) I = _____ in./hr.

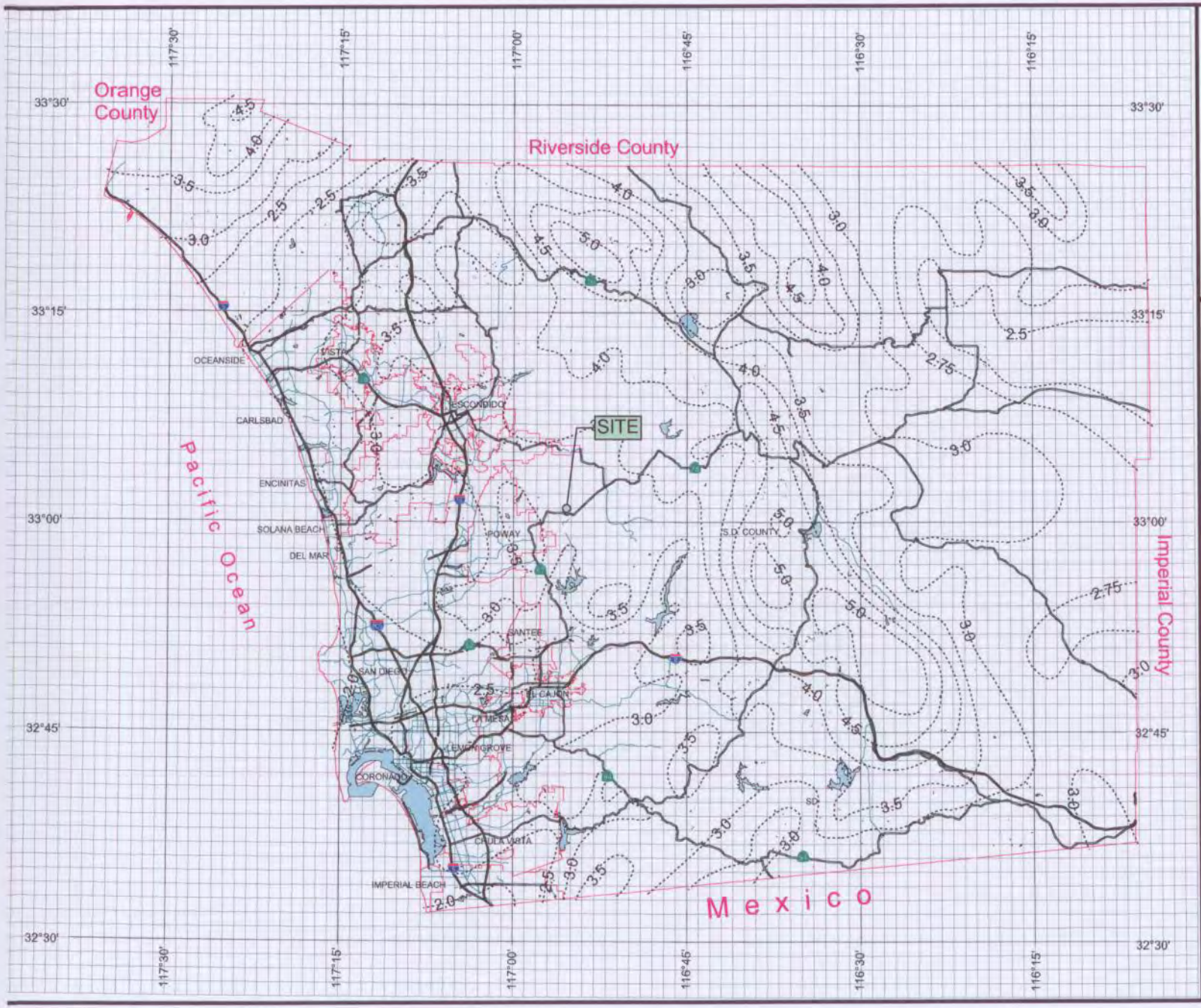
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

$P_6 = 3.5$

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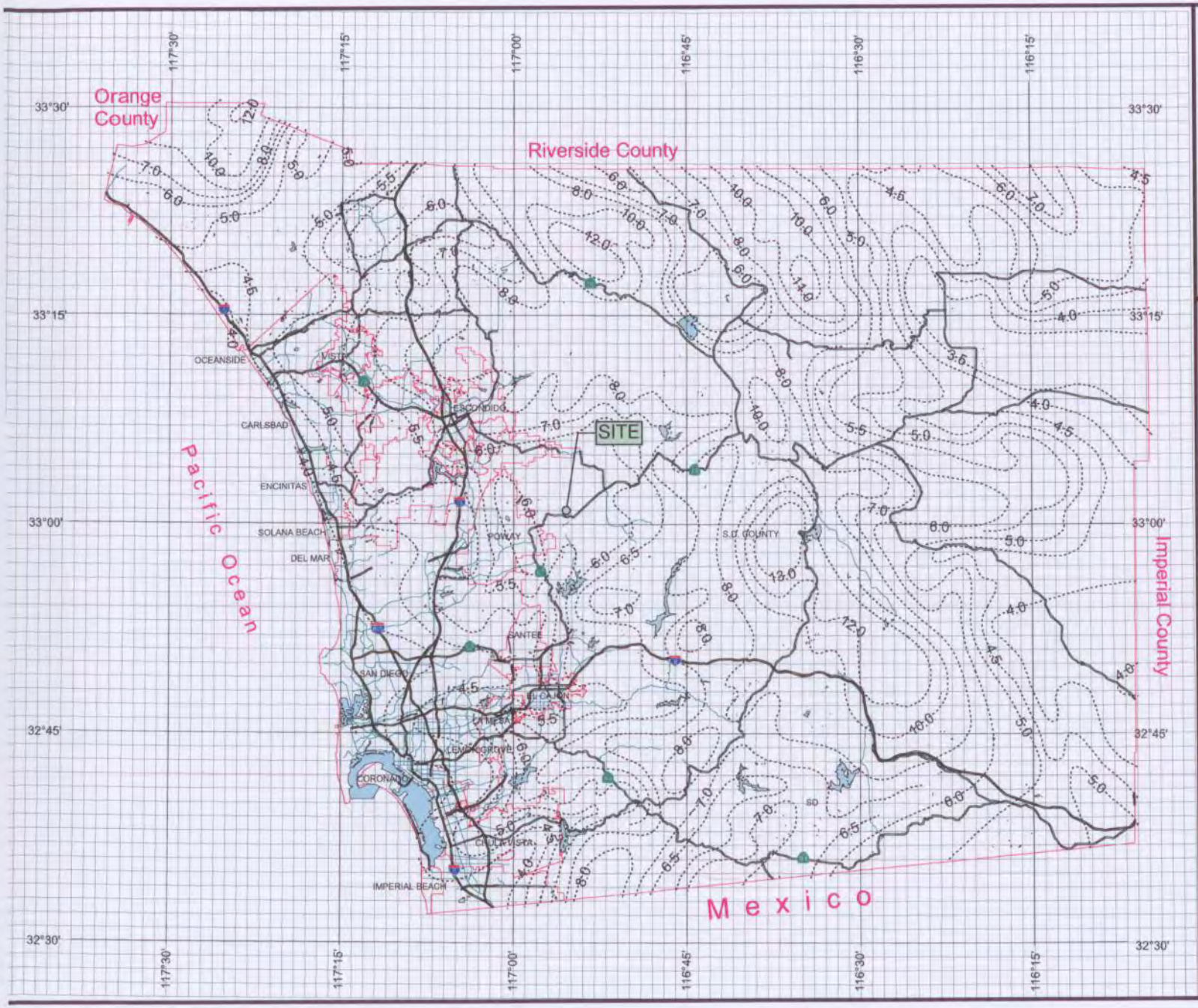

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

$P_{24} = 6.0$

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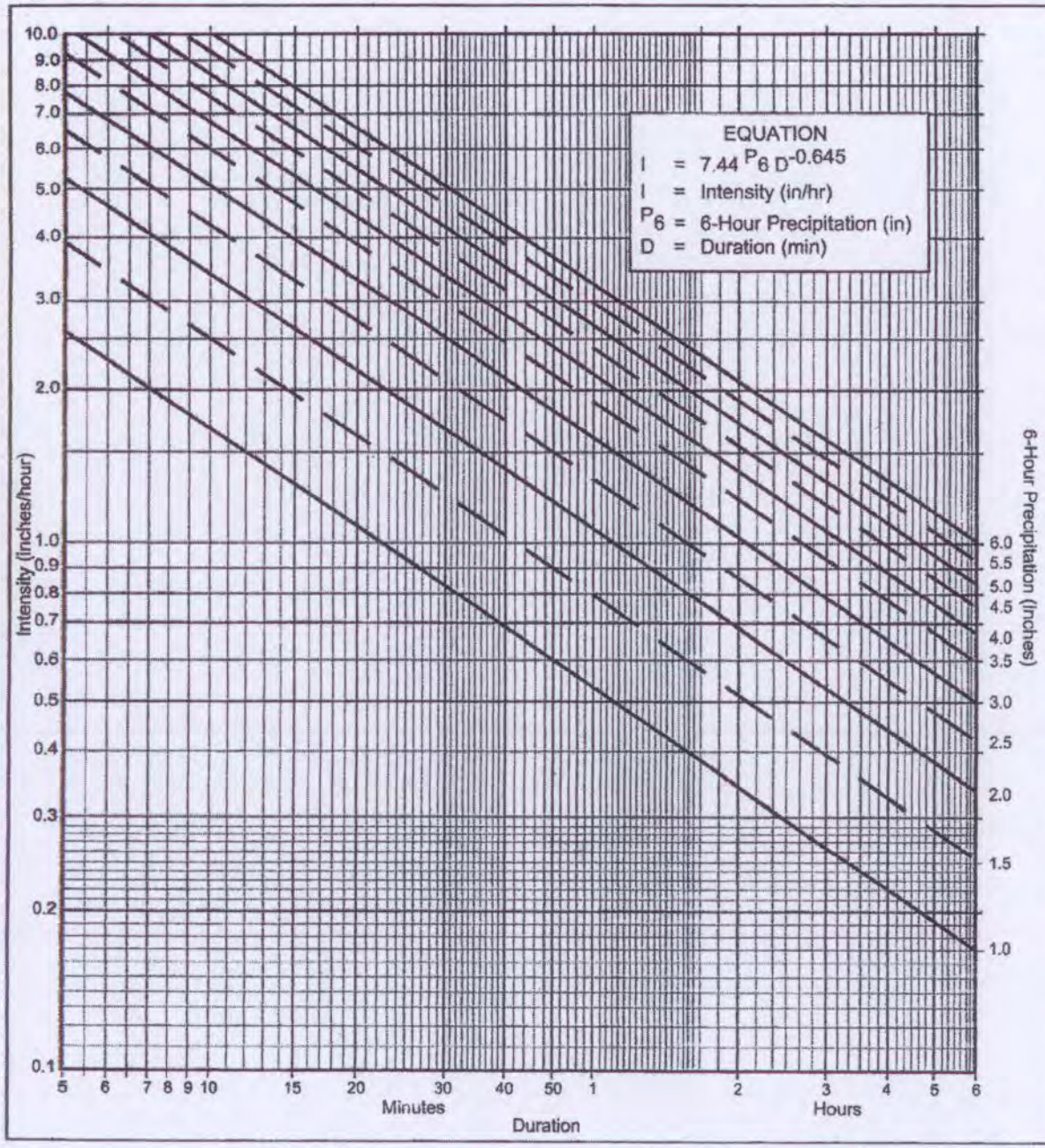


Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.5 in., P_{24} = 6.0 , $\frac{P_6}{P_{24}}$ = 58 %(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

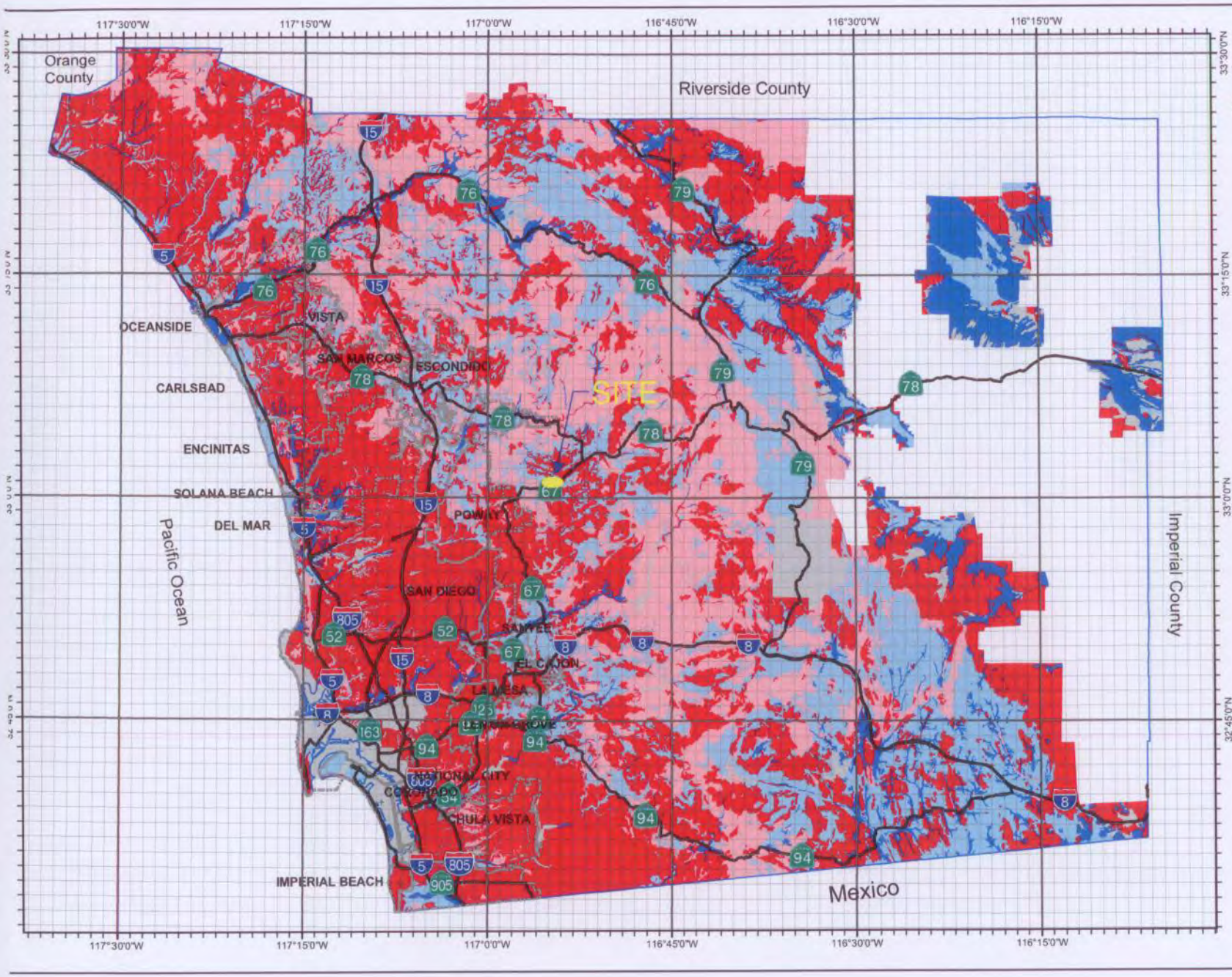
FIGURE

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 Group

Legend

- Major Roads
- Incorporated City Bdy

HYDROLOGIC SOIL GROUP

- Hydrologic Group Undefined
- Hydrologic Group A
- Hydrologic Group B
- Hydrologic Group C
- Hydrologic Group D
- No Soil Data

Note: Soil Data Source
USDA/NRCS
SSURGO Soils 2007

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                        Analysis prepared by:

                         Snipes-Dye Associates
                       8348 Center Drive, Suite G
                        La Mesa, CA  91942-2910
                 Fax (619)460-2033  Phone (619)697-9234

 ************************** DESCRIPTION OF STUDY **************************
* SPIRIT OF JOY CHURCH PRE-DEVELOPMENT STUDY 10-YEAR                       *
* MAJOR USE PERMIT                                                         *
* RAMONA, CALIFORNIA                                                       *
 ****************************************************************************

  FILE NAME: RA027PR1.DAT
  TIME/DATE OF STUDY: 08:06 09/27/2010
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*
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SOUTH BASIN

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****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1788.00
  DOWNSTREAM ELEVATION(FEET) =   1781.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.493
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.897
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1781.00
  DOWNSTREAM NODE ELEVATION(FEET) =   1420.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  4250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.382
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     33.75
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.30
  AVERAGE FLOW DEPTH(FEET) =   0.51   FLOOD WIDTH(FEET) =   34.33
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  13.36   Tc(MIN.) =  19.85
  SUBAREA AREA(ACRES) =   75.25       SUBAREA RUNOFF(CFS) =   62.73
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     75.34         PEAK FLOW RATE(CFS) =      62.82

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.62   FLOOD WIDTH(FEET) =   44.84
  FLOW VELOCITY(FEET/SEC.) =   5.97   DEPTH*VELOCITY(FT*FT/SEC) =   3.69
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  4350.00 FEET.
```

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****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1420.90  DOWNSTREAM(FEET) =  1420.50
  FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.77
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =     62.82
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =  19.93
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  4435.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.50
  DOWNSTREAM NODE ELEVATION(FEET) =   1418.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   355.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   5.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.166
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     64.98
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.93
  AVERAGE FLOW DEPTH(FEET) =   1.01   FLOOD WIDTH(FEET) =   81.25
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   3.06   Tc(MIN.) =  23.00
  SUBAREA AREA(ACRES) =    5.72       SUBAREA RUNOFF(CFS) =    4.34
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     81.06         PEAK FLOW RATE(CFS) =      62.82

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.00   FLOOD WIDTH(FEET) =   80.20
  FLOW VELOCITY(FEET/SEC.) =   1.92   DEPTH*VELOCITY(FT*FT/SEC) =   1.92
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =  4790.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1418.90  DOWNSTREAM(FEET) =   1416.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0400
  CHANNEL BASE(FEET) =    7.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.162
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     62.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.46
  AVERAGE FLOW DEPTH(FEET) =   0.67   TRAVEL TIME(MIN.) =   0.07
  Tc(MIN.) =  23.06
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     81.07         PEAK FLOW RATE(CFS) =      62.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.67   FLOW VELOCITY(FEET/SEC.) =  13.46
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =  4845.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1416.70
  DOWNSTREAM NODE ELEVATION(FEET) =   1415.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.200   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   5.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.083
  PASTURE OR RANGE LAND POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     63.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.01
  AVERAGE FLOW DEPTH(FEET) =   1.55   FLOOD WIDTH(FEET) =   39.12
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.38   Tc(MIN.) =  24.45
  SUBAREA AREA(ACRES) =    1.84       SUBAREA RUNOFF(CFS) =    1.34
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     82.91         PEAK FLOW RATE(CFS) =      62.82

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.55   FLOOD WIDTH(FEET) =   38.95
  FLOW VELOCITY(FEET/SEC.) =   3.01   DEPTH*VELOCITY(FT*FT/SEC) =   4.65
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =  5095.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  24.45
  RAINFALL INTENSITY(INCH/HR) =   2.08
  TOTAL STREAM AREA(ACRES) =    82.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     62.82

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =   1427.00
  DOWNSTREAM ELEVATION(FEET) =   1426.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.227
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.904
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.18
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1426.00
  DOWNSTREAM NODE ELEVATION(FEET) =   1419.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1310.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.100
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.995
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      8.68
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.29
  AVERAGE FLOW DEPTH(FEET) =   0.46   FLOOD WIDTH(FEET) =   35.62
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  16.89   Tc(MIN.) =  26.12
  SUBAREA AREA(ACRES) =   19.72       SUBAREA RUNOFF(CFS) =   16.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
  TOTAL AREA(ACRES) =     19.83         PEAK FLOW RATE(CFS) =      16.22

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.56   FLOOD WIDTH(FEET) =   46.10
  FLOW VELOCITY(FEET/SEC.) =   1.47   DEPTH*VELOCITY(FT*FT/SEC) =   0.83
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE     10.00 =  1380.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1419.20  DOWNSTREAM(FEET) =  1418.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.18
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     16.22
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =  26.23
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE     11.00 =  1440.00 FEET.
```

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****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE      7.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1418.60
  DOWNSTREAM NODE ELEVATION(FEET) =   1415.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   585.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   5.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.790
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     17.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.08
  AVERAGE FLOW DEPTH(FEET) =   0.76   FLOOD WIDTH(FEET) =   25.39
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   4.69   Tc(MIN.) =  30.92
  SUBAREA AREA(ACRES) =    4.58       SUBAREA RUNOFF(CFS) =    2.87
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.399
  TOTAL AREA(ACRES) =     24.41         PEAK FLOW RATE(CFS) =      17.42

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.76   FLOOD WIDTH(FEET) =   25.25
  FLOW VELOCITY(FEET/SEC.) =   2.07   DEPTH*VELOCITY(FT*FT/SEC) =   1.57
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE      7.00 =  2025.00 FEET.
```

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****************************************************************************
  FLOW PROCESS FROM NODE       7.00 TO NODE       7.00 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 ============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  30.92
  RAINFALL INTENSITY(INCH/HR) =   1.79
  TOTAL STREAM AREA(ACRES) =    24.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.42

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1        62.82    24.45       2.083         82.91
     2        17.42    30.92       1.790         24.41

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        76.59    24.45       2.083
     2        71.40    30.92       1.790

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     76.59   Tc(MIN.) =   24.45
  TOTAL AREA(ACRES) =    107.32
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =  5095.00 FEET.
```

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****************************************************************************
   FLOW PROCESS FROM NODE       7.00 TO NODE      12.00 IS CODE =  91
 ----------------------------------------------------------------------------
   >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
 ============================================================================
   UPSTREAM NODE ELEVATION(FEET) =   1415.00
   DOWNSTREAM NODE ELEVATION(FEET) =   1412.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00
   "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
   PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0300
   PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
   MAXIMUM DEPTH(FEET) =   5.00
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.014
   PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
   SOIL CLASSIFICATION IS "D"
   S.C.S. CURVE NUMBER (AMC II) =  84
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     77.35
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.50
   AVERAGE FLOW DEPTH(FEET) =   2.23   FLOOD WIDTH(FEET) =   18.28
   "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.30   Tc(MIN.) =  25.74
   SUBAREA AREA(ACRES) =    2.17       SUBAREA RUNOFF(CFS) =    1.53
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.361
   TOTAL AREA(ACRES) =    109.49         PEAK FLOW RATE(CFS) =      79.60

   END OF SUBAREA "V" GUTTER HYDRAULICS:
   DEPTH(FEET) =  2.25   FLOOD WIDTH(FEET) =   18.48
   FLOW VELOCITY(FEET/SEC.) =   4.53   DEPTH*VELOCITY(FT*FT/SEC) =  10.18
   LONGEST FLOWPATH FROM NODE      1.00 TO NODE     12.00 =  5445.00 FEET.
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SOUTH BASIN Qcc

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============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)      =    109.49  TC(MIN.) =     25.74
   PEAK FLOW RATE(CFS)    =     79.60
   FLOW VELOCITY (FEET/SEC.) = 4.53
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     23.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1412.00
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   334.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
  MAXIMUM DEPTH(FEET) =   5.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.969
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     80.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.99
  AVERAGE FLOW DEPTH(FEET) =   2.00   FLOOD WIDTH(FEET) =   16.03
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.93   Tc(MIN.) =  26.67
  SUBAREA AREA(ACRES) =    1.27       SUBAREA RUNOFF(CFS) =    0.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.361
  TOTAL AREA(ACRES) =    110.76         PEAK FLOW RATE(CFS) =      79.60

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  2.00   FLOOD WIDTH(FEET) =   16.00
  FLOW VELOCITY(FEET/SEC.) =   5.98   DEPTH*VELOCITY(FT*FT/SEC) =  11.97
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     23.00 =  5779.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  26.67
  RAINFALL INTENSITY(INCH/HR) =   1.97
  TOTAL STREAM AREA(ACRES) =   110.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     79.60
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NORTH BASIN

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****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =   1420.20
  DOWNSTREAM ELEVATION(FEET) =   1419.60
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.395

    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.407
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.13
```

```
****************************************************************************
   FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  91
 ----------------------------------------------------------------------------
   >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
 ============================================================================
   UPSTREAM NODE ELEVATION(FEET) =   1419.60
   DOWNSTREAM NODE ELEVATION(FEET) =   1409.60
   CHANNEL LENGTH THRU SUBAREA(FEET) =   580.00
   "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
   PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
   PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
   MAXIMUM DEPTH(FEET) =   2.00
     10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.659
   PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
   SOIL CLASSIFICATION IS "D"
   S.C.S. CURVE NUMBER (AMC II) =  84
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.24
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.81
   AVERAGE FLOW DEPTH(FEET) =   0.25   FLOOD WIDTH(FEET) =    5.00
   "V" GUTTER FLOW TRAVEL TIME(MIN.) =   5.35   Tc(MIN.) =  16.74
   SUBAREA AREA(ACRES) =    2.36       SUBAREA RUNOFF(CFS) =    2.20
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
   TOTAL AREA(ACRES) =      2.47         PEAK FLOW RATE(CFS) =       2.30

   END OF SUBAREA "V" GUTTER HYDRAULICS:
   DEPTH(FEET) =  0.30   FLOOD WIDTH(FEET) =    7.15
   FLOW VELOCITY(FEET/SEC.) =   2.13   DEPTH*VELOCITY(FT*FT/SEC) =   0.65
   LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =   650.00 FEET.
```

NORTH BASIN QDD

```
============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)      =    2.47  TC(MIN.) =     16.74
   PEAK FLOW RATE(CFS)    =    2.30
   FLOW VELOCITY (FEET/SEC.) = 2.13
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  91
 ----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
 ============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1409.60
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.574
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.52
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.57
  AVERAGE FLOW DEPTH(FEET) =   0.29   FLOOD WIDTH(FEET) =    6.61
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.86   Tc(MIN.) =  17.60
  SUBAREA AREA(ACRES) =    0.50       SUBAREA RUNOFF(CFS) =    0.45
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      2.97         PEAK FLOW RATE(CFS) =       2.68

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOOD WIDTH(FEET) =    6.88
  FLOW VELOCITY(FEET/SEC.) =   2.60   DEPTH*VELOCITY(FT*FT/SEC) =   0.77
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =   782.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
 ----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
 ============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  17.60
  RAINFALL INTENSITY(INCH/HR) =   2.57
  TOTAL STREAM AREA(ACRES) =     2.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.68

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1       79.60    26.67        1.969        110.76
     2        2.68    17.60        2.574          2.97

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       63.55    17.60       2.574
     2       81.64    26.67       1.969

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     81.64   Tc(MIN.) =   26.67
  TOTAL AREA(ACRES) =    113.73
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     23.00 =  5779.00 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  41
 ----------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
 ============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =  1406.10  DOWNSTREAM(FEET) =  1404.70
   FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  36.0 INCH PIPE IS  15.7 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =  13.80
   GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   2
   PIPE-FLOW(CFS) =     81.64
   PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =  26.74
   LONGEST FLOWPATH FROM NODE      1.00 TO NODE     24.00 =  5834.00 FEET.
```

QEE

```
============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)      =    113.73  TC(MIN.) =     26.74
   PEAK FLOW RATE(CFS)    =     81.64
   FLOW VELOCITY (FEET/SEC.) = 13.80
 ============================================================================
 ============================================================================
   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 1982-2005 Advanced Engineering Software (aes)
            Ver. 2.0 Release Date: 06/01/2005  License ID 1305

                          Analysis prepared by:

                          Snipes-Dye Associates
                        8348 Center Drive, Suite G
                         La Mesa, CA  91942-2910
                   Fax (619)460-2033  Phone (619)697-9234

 ************************** DESCRIPTION OF STUDY **************************
* SPIRIT OF JOY CHURCH PRE-DEVELOPMENT STUDY 100-YEAR                      *
* MAJOR USE PERMIT                                                         *
* RAMONA, CALIFORNIA                                                       *
 ****************************************************************************

  FILE NAME: RA027PR1.DAT
  TIME/DATE OF STUDY: 15:36 09/24/2010
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
```

SOUTH BASIN

```
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1788.00
  DOWNSTREAM ELEVATION(FEET) =   1781.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.493
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.791
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1781.00
  DOWNSTREAM NODE ELEVATION(FEET) =   1420.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =  4250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.944
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     55.87
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.82
  AVERAGE FLOW DEPTH(FEET) =   0.60   FLOOD WIDTH(FEET) =   42.71
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  12.16   Tc(MIN.) =  18.66
  SUBAREA AREA(ACRES) =   75.25       SUBAREA RUNOFF(CFS) =  103.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     75.34         PEAK FLOW RATE(CFS) =     104.02

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.72   FLOOD WIDTH(FEET) =   55.04
  FLOW VELOCITY(FEET/SEC.) =   6.66   DEPTH*VELOCITY(FT*FT/SEC) =   4.80
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  4350.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1420.90  DOWNSTREAM(FEET) =  1420.50
  FLOW LENGTH(FEET) =    85.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  29.43
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =    104.02
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =  18.71
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =  4435.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.50
  DOWNSTREAM NODE ELEVATION(FEET) =   1418.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   355.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.607
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    107.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.17
  AVERAGE FLOW DEPTH(FEET) =   1.19   FLOOD WIDTH(FEET) =   98.99
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =  21.43
  SUBAREA AREA(ACRES) =    5.72       SUBAREA RUNOFF(CFS) =    7.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     81.06         PEAK FLOW RATE(CFS) =     104.02

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.18   FLOOD WIDTH(FEET) =   97.72
  FLOW VELOCITY(FEET/SEC.) =   2.15   DEPTH*VELOCITY(FT*FT/SEC) =   2.53
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      5.00 =  4790.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1418.90  DOWNSTREAM(FEET) =   1416.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    55.00   CHANNEL SLOPE =  0.0400
  CHANNEL BASE(FEET) =    7.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.600
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    104.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  16.05
  AVERAGE FLOW DEPTH(FEET) =   0.93   TRAVEL TIME(MIN.) =   0.06
  Tc(MIN.) =  21.49
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     81.07         PEAK FLOW RATE(CFS) =     104.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =  16.05
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      6.00 =  4845.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1416.70
  DOWNSTREAM NODE ELEVATION(FEET) =   1415.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.200   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.471
  PASTURE OR RANGE LAND POOR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    105.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.31
  AVERAGE FLOW DEPTH(FEET) =   1.80   FLOOD WIDTH(FEET) =   48.82
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.26   Tc(MIN.) =  22.75
  SUBAREA AREA(ACRES) =    1.84       SUBAREA RUNOFF(CFS) =    2.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =     82.91         PEAK FLOW RATE(CFS) =     104.02

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.79   FLOOD WIDTH(FEET) =   48.61
  FLOW VELOCITY(FEET/SEC.) =   3.31   DEPTH*VELOCITY(FT*FT/SEC) =   5.92
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =  5095.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  22.75
  RAINFALL INTENSITY(INCH/HR) =   3.47
  TOTAL STREAM AREA(ACRES) =    82.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    104.02

****************************************************************************
  FLOW PROCESS FROM NODE      8.00 TO NODE      9.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =   1427.00
  DOWNSTREAM ELEVATION(FEET) =   1426.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.227
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.211
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.28
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1426.00
  DOWNSTREAM NODE ELEVATION(FEET) =   1419.20
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1310.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.100
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.311
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     14.36
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.43
  AVERAGE FLOW DEPTH(FEET) =   0.54   FLOOD WIDTH(FEET) =   43.93
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =  15.24   Tc(MIN.) =  24.47
  SUBAREA AREA(ACRES) =   19.72       SUBAREA RUNOFF(CFS) =   26.77
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
  TOTAL AREA(ACRES) =     19.83         PEAK FLOW RATE(CFS) =      26.92

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.66   FLOOD WIDTH(FEET) =   56.40
  FLOW VELOCITY(FEET/SEC.) =   1.65   DEPTH*VELOCITY(FT*FT/SEC) =   1.10
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE     10.00 =  1380.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1419.20  DOWNSTREAM(FEET) =  1418.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.024
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.23
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     26.92
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =  24.53
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE     11.00 =  1440.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE      7.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1418.60
  DOWNSTREAM NODE ELEVATION(FEET) =   1415.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   585.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.984
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     29.32
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.31
  AVERAGE FLOW DEPTH(FEET) =   0.91   FLOOD WIDTH(FEET) =   31.28
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   4.21   Tc(MIN.) =  28.75
  SUBAREA AREA(ACRES) =    4.58       SUBAREA RUNOFF(CFS) =    4.78
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.399
  TOTAL AREA(ACRES) =     24.41         PEAK FLOW RATE(CFS) =      29.05

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.90   FLOOD WIDTH(FEET) =   31.14
  FLOW VELOCITY(FEET/SEC.) =   2.31   DEPTH*VELOCITY(FT*FT/SEC) =   2.09
  LONGEST FLOWPATH FROM NODE      8.00 TO NODE      7.00 =  2025.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      7.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  28.75
  RAINFALL INTENSITY(INCH/HR) =   2.98
  TOTAL STREAM AREA(ACRES) =    24.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.05

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1       104.02    22.75       3.471        82.91
     2        29.05    28.75       2.984        24.41

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       127.01    22.75       3.471
     2       118.50    28.75       2.984

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    127.01   Tc(MIN.) =   22.75
  TOTAL AREA(ACRES) =    107.32
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      7.00 =  5095.00 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE      7.00 TO NODE     12.00 IS CODE =  91
 ----------------------------------------------------------------------------
   >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
 ============================================================================
   UPSTREAM NODE ELEVATION(FEET) =   1415.00
   DOWNSTREAM NODE ELEVATION(FEET) =   1412.00
   CHANNEL LENGTH THRU SUBAREA(FEET) =   350.00
   "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
   PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0300
   PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
   MAXIMUM DEPTH(FEET) =   5.00
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.362
   PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
   SOIL CLASSIFICATION IS "D"
   S.C.S. CURVE NUMBER (AMC II) =  84
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    128.29
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.06
   AVERAGE FLOW DEPTH(FEET) =   2.63   FLOOD WIDTH(FEET) =   22.30
   "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.15   Tc(MIN.) =  23.90
   SUBAREA AREA(ACRES) =    2.17       SUBAREA RUNOFF(CFS) =    2.55
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.361
   TOTAL AREA(ACRES) =    109.49         PEAK FLOW RATE(CFS) =     132.85

   END OF SUBAREA "V" GUTTER HYDRAULICS:
   DEPTH(FEET) =  2.66   FLOOD WIDTH(FEET) =   22.61
   FLOW VELOCITY(FEET/SEC.) =   5.10   DEPTH*VELOCITY(FT*FT/SEC) =  13.57
   LONGEST FLOWPATH FROM NODE      1.00 TO NODE     12.00 =  5445.00 FEET.
```

SOUTH BASIN Qcc

```
============================================================================
   SUMMARY:
   TOTAL AREA(ACRES)      =    109.49  TC(MIN.) =     23.90
   PEAK FLOW RATE(CFS)    =    132.85
   FLOW VELOCITY (FEET/SEC.) = 5.10
 ============================================================================
```

```
****************************************************************************
 FLOW PROCESS FROM NODE     12.00 TO NODE     23.00 IS CODE =  91
----------------------------------------------------------------------------
 >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
 UPSTREAM NODE ELEVATION(FEET) =   1412.00
 DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
 CHANNEL LENGTH THRU SUBAREA(FEET) =   334.00
 "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
 PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0300
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
 MAXIMUM DEPTH(FEET) =   5.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.289
 PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
 SOIL CLASSIFICATION IS "D"
 S.C.S. CURVE NUMBER (AMC II) =  84
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    133.58
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.73
 AVERAGE FLOW DEPTH(FEET) =   2.37   FLOOD WIDTH(FEET) =   19.67
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.83   Tc(MIN.) =  24.73
 SUBAREA AREA(ACRES) =    1.27       SUBAREA RUNOFF(CFS) =    1.46
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.361
 TOTAL AREA(ACRES) =    110.76         PEAK FLOW RATE(CFS) =     132.85

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  2.36   FLOOD WIDTH(FEET) =   19.62
 FLOW VELOCITY(FEET/SEC.) =   6.73   DEPTH*VELOCITY(FT*FT/SEC) =  15.89
 LONGEST FLOWPATH FROM NODE      1.00 TO NODE     23.00 =  5779.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =  24.73
 RAINFALL INTENSITY(INCH/HR) =   3.29
 TOTAL STREAM AREA(ACRES) =   110.76
 PEAK FLOW RATE(CFS) AT CONFLUENCE =    132.85
```

NORTH BASIN

```
****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =   1420.20
  DOWNSTREAM ELEVATION(FEET) =   1419.60
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.395

   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.421
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.21
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1419.60
  DOWNSTREAM NODE ELEVATION(FEET) =   1409.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   580.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.337
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.05
  AVERAGE FLOW DEPTH(FEET) =   0.29   FLOOD WIDTH(FEET) =    6.61
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   4.71   Tc(MIN.) =  16.10
  SUBAREA AREA(ACRES) =    2.36       SUBAREA RUNOFF(CFS) =    3.58
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      2.47         PEAK FLOW RATE(CFS) =       3.75

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.37   FLOOD WIDTH(FEET) =    9.61
  FLOW VELOCITY(FEET/SEC.) =   2.35   DEPTH*VELOCITY(FT*FT/SEC) =   0.86
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     22.00 =   650.00 FEET.
```

NORTH BASIN Q_{DD}

```
============================================================================
  SUMMARY:
  TOTAL AREA(ACRES)      =    2.47  TC(MIN.) =     16.10
  PEAK FLOW RATE(CFS)    =    3.75
  FLOW VELOCITY (FEET/SEC.) = 2.35
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1409.60
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.050   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.209
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      4.12
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.87
  AVERAGE FLOW DEPTH(FEET) =   0.35   FLOOD WIDTH(FEET) =    8.93
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.77   Tc(MIN.) =  16.87
  SUBAREA AREA(ACRES) =    0.50       SUBAREA RUNOFF(CFS) =    0.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      2.97         PEAK FLOW RATE(CFS) =       4.38

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.36   FLOOD WIDTH(FEET) =    9.27
  FLOW VELOCITY(FEET/SEC.) =   2.89   DEPTH*VELOCITY(FT*FT/SEC) =   1.03
  LONGEST FLOWPATH FROM NODE     20.00 TO NODE     23.00 =   782.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  16.87
  RAINFALL INTENSITY(INCH/HR) =   4.21
  TOTAL STREAM AREA(ACRES) =     2.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.38

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1      132.85    24.73        3.289        110.76
     2        4.38    16.87        4.209          2.97

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1      108.18    16.87       4.209
     2      136.27    24.73       3.289

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    136.27   Tc(MIN.) =   24.73
  TOTAL AREA(ACRES) =    113.73
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE     23.00 =  5779.00 FEET.
```

```
****************************************************************************
   FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  41
 ----------------------------------------------------------------------------
   >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
 ============================================================================
   ELEVATION DATA: UPSTREAM(FEET) =  1406.10  DOWNSTREAM(FEET) =  1404.70
   FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
   DEPTH OF FLOW IN  36.0 INCH PIPE IS  21.3 INCHES
   PIPE-FLOW VELOCITY(FEET/SEC.) =  15.66
   GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   2
   PIPE-FLOW(CFS) =    136.27
   PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =  24.79
   LONGEST FLOWPATH FROM NODE      1.00 TO NODE     24.00 =  5834.00 FEET.
```

QEE

```
============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)      =    113.73  TC(MIN.) =     24.79
   PEAK FLOW RATE(CFS)    =    136.27
   FLOW VELOCITY (FEET/SEC.) = 15.66
 ============================================================================
 ============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

COUNTY OF SAN DIEGO — TOPOGRAPHIC SURVEY

-LEGEND-

- Horizontal Control Monument, *Third Order*; Vertical Control Monument, *Second Order or Better*
- Horizontal Control Monument, *Second Order or Better*; Vertical Control Monument, *Third Order*
- Horizontal Control Monument, *Second Order or Better*
- Horizontal Control Monument & Bench Mark, *Second Order or Better*
- Horizontal Control Monument, *Third Order*
- Horizontal Control Monument & Bench Mark, *Third Order*
- Bench Mark, *Second Order or Better*
- Vertical Control Monument, *Third Order*
- Property Corner Found & Coordinated (California Coordinate System, Zone 6)
- 38 31 / 16 / T10S R1W / T11S R1W — Found Section, Grant or Subdivision Corner
- Photograph, Nadir Point
- Geographic Tick

BOUNDARIES IN ORDER OF PRECEDENCE
(Land Lines Shown are Approximate)

- .025" — National
- Name .025" Name — County
- .015" — City
- Name within Bdry. .015" — Reservation
- Name within Bdry. .015" — National, State or County Park
- Name within Bdry. .015" — Land Grant
- T2S T3S .015" — Township, Range or Section

PREPARED UNDER THE DIRECTION
of
DEPARTMENT OF PUBLIC WORKS
County of San Diego

CONTROL DATA FURNISHED
by
SURVEY SECTION
Department of Public Works

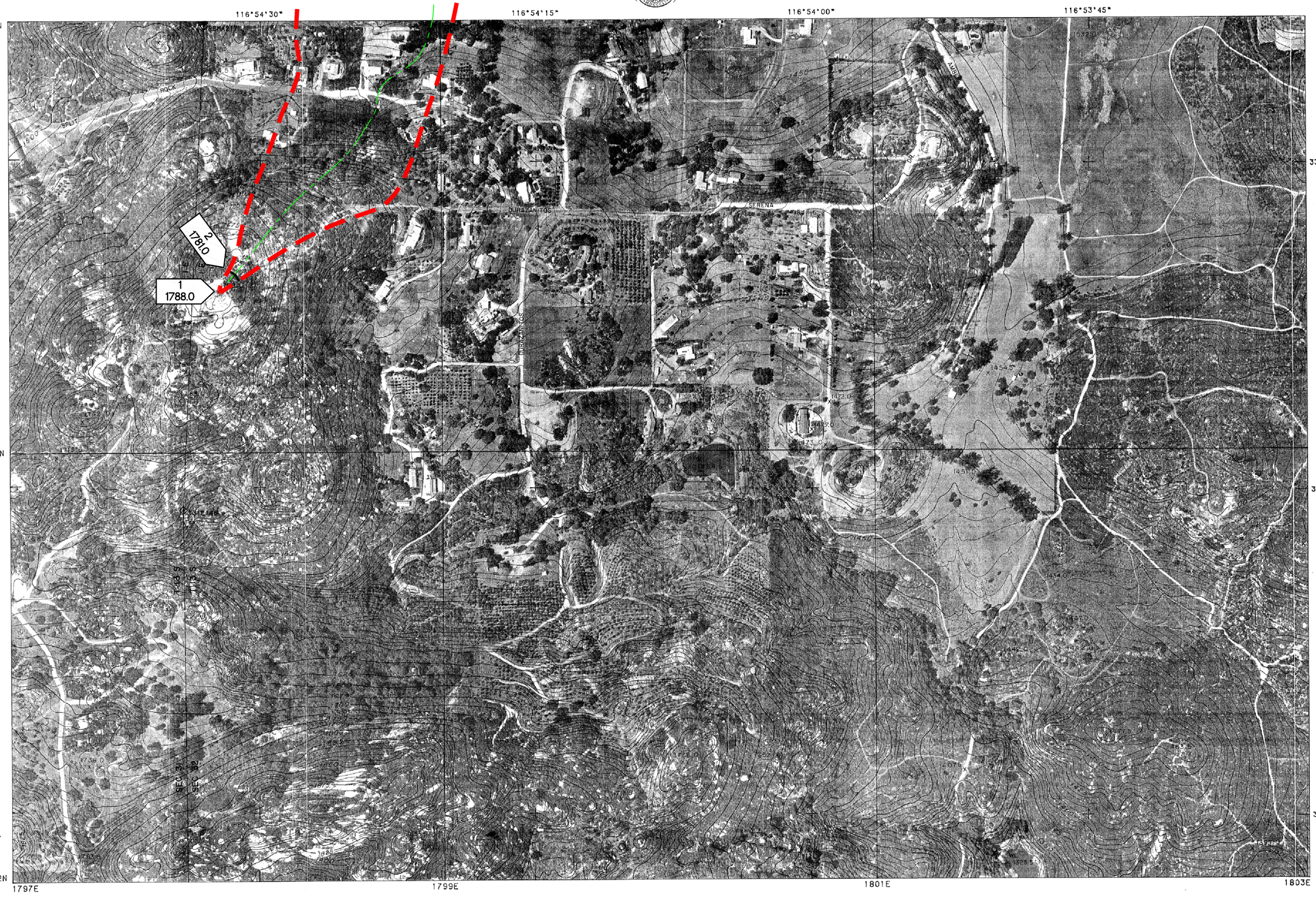
HORIZONTAL CONTROL BASED
on
NORTH AMERICAN 1927 DATUM

VERTICAL CONTROL BASED
on
U.S.C. & G.S. 1929 SEA LEVEL DATUM

ORTHOPHOTO IMAGE PREPARED
from
PHOTOGRAPHY DATED: APRIL 13, 1984
by
AMERICAN AERIAL SURVEYS, INC.

TOPOGRAPHY COMPILED
by
PHOTOGRAMMETRIC METHODS
from
PHOTOGRAPHY DATED: APRIL 13, 1984
by
BARTON WALTERS & ASSOCIATES, INC.

FINAL MAP PREPARED
by
MAPPING SECTION
Department of Public Works



This Map Complies with
NATIONAL MAP ACCURACY STANDARDS

200 0 200 400 600 800 1000 (Feet)
100 0 100 200 300 (Meters)

SCALE 1: 2400 (1"= 200')

INDEX CONTOUR INTERVAL: 25 FEET
CONTOUR INTERVAL: 5 FEET

TWO THOUSAND FOOT CALIFORNIA RECTANGULAR GRID (ZONE VI)
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED
THE RECTANGULAR COORDINATE VALUES ARE SHOWN ON THE SOUTH AND WEST MARGINS
THE GEOGRAPHIC VALUES ARE SHOWN ON THE NORTH AND EAST MARGINS

INDEX TO ADJOINING SHEETS

306-1791	306-1797	306-1803
302-1791	302-1797	302-1803
298-1791	298-1797	298-1803

SAN DIEGO COUNTY
CALIFORNIA

SHEET NO. 302-1797 1 OF 2
PRE-DEVELOPMENT

COUNTY OF SAN DIEGO — TOPOGRAPHIC SURVEY

-LEGEND-

- Horizontal Control Monument, *Third Order*; Vertical Control Monument, *Second Order or Better*
- Horizontal Control Monument, *Second Order or Better*; Vertical Control Monument, *Third Order*
- Horizontal Control Monument, *Second Order or Better*
- Horizontal Control Monument & Bench Mark, *Second Order or Better*
- Horizontal Control Monument, *Third Order*
- Horizontal Control Monument & Bench Mark, *Third Order*
- Bench Mark, *Second Order or Better*
- Vertical Control Monument, *Third Order*
- Property Corner Found & Coordinated (California Coordinate System, Zone 6)
- 36 31 T 12 S 1 6 T 13 S R 2 W R 1 W — Found Section, Grant or Subdivision Corner
- Photograph, Nadir Point
- Geographic Tick

BOUNDARIES IN ORDER OF PRECEDENCE
(Land Lines Shown are Approximate)

- .025" — National
- Name .025" Name — County
- .015" — City
- Name within Bdry .015" — Reservation
- Name within Bdry .015" — National, State or County Park
- Name within Bdry .015" — Land Grant
- T2S T3S .015" — Township, Range or Section

PREPARED UNDER THE DIRECTION
of
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CONTROL DATA FURNISHED
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HORIZONTAL CONTROL BASED
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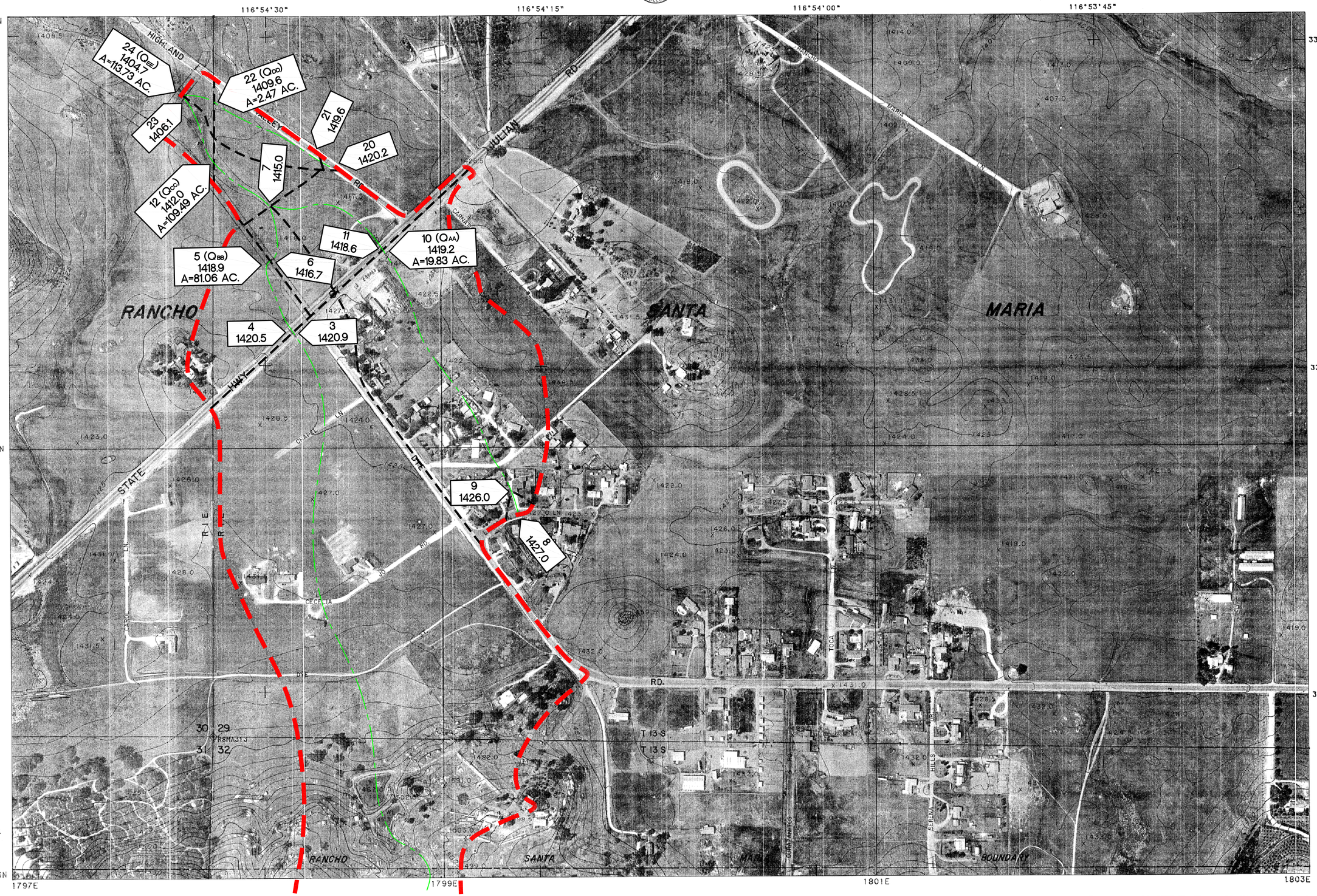
FINAL MAP PREPARED
by
MAPPING SECTION
Department of Public Works



This Map Complies with
NATIONAL MAP ACCURACY STANDARDS

200 0 200 400 600 800 1000 (Feet)
100 0 100 200 300 (Meters)

SCALE 1: 2400 (1" = 200')
NDEX CONTOUR INTERVAL: 25 FEET
CONTOUR INTERVAL: 5 FEET

TWO THOUSAND FOOT CALIFORNIA RECTANGULAR GRID (ZONE VI)
THE LAST THREE DIGITS OF THE GRID NUMBERS ARE OMITTED
THE RECTANGULAR COORDINATE VALUES ARE SHOWN ON THE SOUTH AND WEST MARGINS
THE GEOGRAPH C VALUES ARE SHOWN ON THE NORTH AND EAST MARGINS

INDEX TO ADJOINING SHEETS

310-1791	310-1797	310-1803
306-1791	306-1797	306-1803
302-1791	302-1797	302-1803

SAN DIEGO COUNTY
CALIFORNIA

SHEET NO. 306-1797 2 OF 2
PRE-DEVELOPMENT

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
        (c) Copyright 1982-2005 Advanced Engineering Software (aes)
            Ver. 2.0 Release Date: 06/01/2005  License ID 1305

                          Analysis prepared by:

                          Snipes-Dye Associates
                        8348 Center Drive, Suite G
                         La Mesa, CA  91942-2910
                  Fax (619)460-2033  Phone (619)697-9234

 ************************** DESCRIPTION OF STUDY **************************
* SPIRIT OF JOY CHURCH POST-DEVELOPMENT STUDY - 10 YEAR                    *
* MUP P08-017, ER 08-09-005                                                *
* RAMONA, CALIFORNIA                                                       *
 ****************************************************************************

  FILE NAME: RA027P01.DAT
  TIME/DATE OF STUDY: 10:31 09/07/2012
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) =  10.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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     10.0    0.020/0.020/0.020   0.50    2.00 0.0200 0.040 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 = 10.0 (FT*FT/S)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*
```

SOUTH BASIN

```
****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  23.00   RAIN INTENSITY(INCH/HOUR) =  2.17
  TOTAL AREA(ACRES) =    81.06   TOTAL RUNOFF(CFS) =     62.82

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1418.90  DOWNSTREAM(FEET) =   1416.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =    98.00   CHANNEL SLOPE =  0.0255
  CHANNEL BASE(FEET) =    7.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.158
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     62.82
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  11.60
  AVERAGE FLOW DEPTH(FEET) =   0.77   TRAVEL TIME(MIN.) =   0.14
  Tc(MIN.) =  23.14
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.358
  TOTAL AREA(ACRES) =     81.07         PEAK FLOW RATE(CFS) =      62.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.77   FLOW VELOCITY(FEET/SEC.) =  11.69
  LONGEST FLOWPATH FROM NODE      0.00 TO NODE      3.00 =    98.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  23.14
  RAINFALL INTENSITY(INCH/HR) =   2.16
  TOTAL STREAM AREA(ACRES) =    81.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     62.82
```

```
****************************************************************************
  FLOW PROCESS FROM NODE       3.10 TO NODE       3.20 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) =     65.00
  UPSTREAM ELEVATION(FEET) =    1425.00
  DOWNSTREAM ELEVATION(FEET) =    1422.50
  ELEVATION DIFFERENCE(FEET) =       2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     6.947
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.688
  SUBAREA RUNOFF(CFS) =       0.16
  TOTAL AREA(ACRES) =       0.10   TOTAL RUNOFF(CFS) =       0.16

****************************************************************************
  FLOW PROCESS FROM NODE       3.20 TO NODE       3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    1422.50  DOWNSTREAM(FEET) =    1420.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    200.00   CHANNEL SLOPE =  0.0125
  CHANNEL BASE(FEET) =     5.00    "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =    2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.357
  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) =       0.42
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =    0.71
  AVERAGE FLOW DEPTH(FEET) =    0.09   TRAVEL TIME(MIN.) =    4.71
  Tc(MIN.) =  11.66
  SUBAREA AREA(ACRES) =      0.44       SUBAREA RUNOFF(CFS) =     0.52
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       0.54         PEAK FLOW RATE(CFS) =       0.63

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =    0.80
  LONGEST FLOWPATH FROM NODE       3.10 TO NODE       3.00 =    265.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  11.66
  RAINFALL INTENSITY(INCH/HR) =   3.36
  TOTAL STREAM AREA(ACRES) =      0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.63
```

```
****************************************************************************
  FLOW PROCESS FROM NODE       6.00 TO NODE       7.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     42.00
  UPSTREAM ELEVATION(FEET) =    1421.75
  DOWNSTREAM ELEVATION(FEET) =    1421.25
  ELEVATION DIFFERENCE(FEET) =       0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     5.173
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.671
  SUBAREA RUNOFF(CFS) =       0.54
  TOTAL AREA(ACRES) =       0.15   TOTAL RUNOFF(CFS) =       0.54

****************************************************************************
  FLOW PROCESS FROM NODE       7.00 TO NODE       3.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1418.00  DOWNSTREAM(FEET) =  1416.40
  FLOW LENGTH(FEET) =   180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.16
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.54
  PIPE TRAVEL TIME(MIN.) =   0.95    Tc(MIN.) =   6.12
  LONGEST FLOWPATH FROM NODE       6.00 TO NODE       3.00 =   222.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   6.12
  RAINFALL INTENSITY(INCH/HR) =   5.09
  TOTAL STREAM AREA(ACRES) =      0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       0.54
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (4.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =   1421.75
  DOWNSTREAM ELEVATION(FEET) =   1420.90
  ELEVATION DIFFERENCE(FEET) =      0.85
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.735
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.045
  SUBAREA RUNOFF(CFS) =      0.69
  TOTAL AREA(ACRES) =      0.33   TOTAL RUNOFF(CFS) =      0.69

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE      3.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1417.00  DOWNSTREAM(FEET) =  1416.40
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.75
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      0.69
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =   8.96
  LONGEST FLOWPATH FROM NODE      9.00 TO NODE      3.00 =   135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.96
  RAINFALL INTENSITY(INCH/HR) =   3.98
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.69

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1       62.82    23.14        2.158        81.07
     2        0.63    11.66        3.357         0.54
     3        0.54     6.12        5.087         0.15
     4        0.69     8.96        3.980         0.33

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

  ** PEAK FLOW RATE TABLE **
```

```
STREAM      RUNOFF      Tc       INTENSITY
NUMBER      (CFS)     (MIN.)    (INCH/HOUR)
   1        17.96      6.12       5.087
   2        25.92      8.96       3.980
   3        33.23     11.66       3.357
   4        63.83     23.14       2.158

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     63.83   Tc(MIN.) =   23.14
TOTAL AREA(ACRES) =     82.09
LONGEST FLOWPATH FROM NODE      3.10 TO NODE      3.00 =   265.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.00 TO NODE     11.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1416.40  DOWNSTREAM(FEET) =   1410.70
CHANNEL LENGTH THRU SUBAREA(FEET) =   604.00   CHANNEL SLOPE =  0.0094
CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.020
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     65.31
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.04
AVERAGE FLOW DEPTH(FEET) =   1.71   TRAVEL TIME(MIN.) =   2.49
Tc(MIN.) =  25.63
SUBAREA AREA(ACRES) =     2.32       SUBAREA RUNOFF(CFS) =    2.95
AREA-AVERAGE RUNOFF COEFFICIENT =  0.366
TOTAL AREA(ACRES) =     84.41         PEAK FLOW RATE(CFS) =      63.83

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  1.70   FLOW VELOCITY(FEET/SEC.) =   4.01
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     11.00 =   869.00 FEET.
```

SOUTH BASIN Qcc

```
============================================================================
SUMMARY:
TOTAL AREA(ACRES)      =    84.41  TC(MIN.) =     25.63
PEAK FLOW RATE(CFS)    =     63.83
PEAK FLOW VELOCITY(FEET/SEC.) =   4.01
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     44.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1410.70
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   265.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
  MAXIMUM DEPTH(FEET) =   5.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.981
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     64.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.66
  AVERAGE FLOW DEPTH(FEET) =   1.87   FLOOD WIDTH(FEET) =   14.73
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.78   Tc(MIN.) =  26.41
  SUBAREA AREA(ACRES) =    1.27       SUBAREA RUNOFF(CFS) =    0.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.366
  TOTAL AREA(ACRES) =     85.68         PEAK FLOW RATE(CFS) =      63.83

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.87   FLOOD WIDTH(FEET) =   14.69
  FLOW VELOCITY(FEET/SEC.) =   5.65   DEPTH*VELOCITY(FT*FT/SEC) =  10.57
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  1134.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     44.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

NORTH BASIN

```
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  26.12   RAIN INTENSITY(INCH/HOUR) =  2.00
  TOTAL AREA(ACRES) =    19.83   TOTAL RUNOFF(CFS) =     16.22

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1419.20  DOWNSTREAM(FEET) =  1418.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.015
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.18
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     16.22
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =  26.23
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      2.00 =  1194.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  26.23
  RAINFALL INTENSITY(INCH/HR) =   1.99
  TOTAL STREAM AREA(ACRES) =    19.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.22

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
  UPSTREAM ELEVATION(FEET) =   1421.75
  DOWNSTREAM ELEVATION(FEET) =   1420.90
  ELEVATION DIFFERENCE(FEET) =      0.85
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.740
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.781
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.16
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.20 TO NODE      2.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1420.90  DOWNSTREAM(FEET) =   1418.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   240.00   CHANNEL SLOPE =  0.0096
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  40.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.366
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.57
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.82
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   4.87
  Tc(MIN.) =  11.61
  SUBAREA AREA(ACRES) =     2.00       SUBAREA RUNOFF(CFS) =    2.76
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
  TOTAL AREA(ACRES) =      2.08         PEAK FLOW RATE(CFS) =       2.87

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.22   FLOW VELOCITY(FEET/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.00 =   285.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  11.61
  RAINFALL INTENSITY(INCH/HR) =   3.37
  TOTAL STREAM AREA(ACRES) =     2.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.87
  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
      1       16.22    26.23        1.990        19.83
      2        2.87    11.61        3.366         2.08

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.05    11.61       3.366
      2       17.92    26.23       1.990

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     17.92   Tc(MIN.) =   26.23
  TOTAL AREA(ACRES) =     21.91
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      2.00 =  1194.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1416.00  DOWNSTREAM(FEET) =  1415.15
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.17
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     17.92
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =  26.66
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     23.00 =  1354.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  26.66
  RAINFALL INTENSITY(INCH/HR) =   1.97
  TOTAL STREAM AREA(ACRES) =    21.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.92

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    51.00
  UPSTREAM ELEVATION(FEET) =   1420.80
  DOWNSTREAM ELEVATION(FEET) =   1420.20
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.723
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.313
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.20
  DOWNSTREAM NODE ELEVATION(FEET) =   1418.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =    91.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0200
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
```

```
  10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.802
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.02
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.56
AVERAGE FLOW DEPTH(FEET) =   0.12   FLOOD WIDTH(FEET) =   10.97
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.97   Tc(MIN.) =   6.69
SUBAREA AREA(ACRES) =    0.56       SUBAREA RUNOFF(CFS) =    1.69
AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
TOTAL AREA(ACRES) =      0.61         PEAK FLOW RATE(CFS) =       1.85

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.15   FLOOD WIDTH(FEET) =   14.09
FLOW VELOCITY(FEET/SEC.) =   1.77   DEPTH*VELOCITY(FT*FT/SEC) =   0.27
LONGEST FLOWPATH FROM NODE     21.00 TO NODE     23.00 =   142.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   6.69
RAINFALL INTENSITY(INCH/HR) =   4.80
TOTAL STREAM AREA(ACRES) =     0.61
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.85

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1       17.92    26.66       1.969        21.91
    2        1.85     6.69       4.802         0.61

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        9.19     6.69       4.802
    2       18.67    26.66       1.969

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     18.67   Tc(MIN.) =   26.66
TOTAL AREA(ACRES) =     22.52
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     23.00 =  1354.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1415.15  DOWNSTREAM(FEET) =  1414.25
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.98
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     18.67
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =  27.18
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     24.00 =  1539.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  27.18
  RAINFALL INTENSITY(INCH/HR) =   1.95
  TOTAL STREAM AREA(ACRES) =    22.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     18.67

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =   1421.34
  DOWNSTREAM ELEVATION(FEET) =   1420.97
  ELEVATION DIFFERENCE(FEET) =      0.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.537
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.448
  SUBAREA RUNOFF(CFS) =      0.50
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.50

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     24.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.97
  DOWNSTREAM NODE ELEVATION(FEET) =   1419.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    96.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.770
```

```
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.88
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.73
AVERAGE FLOW DEPTH(FEET) =   0.14   FLOOD WIDTH(FEET) =   20.97
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.20   Tc(MIN.) =   9.74
SUBAREA AREA(ACRES) =    0.43       SUBAREA RUNOFF(CFS) =    0.75
AREA-AVERAGE RUNOFF COEFFICIENT =  0.510
TOTAL AREA(ACRES) =      0.61         PEAK FLOW RATE(CFS) =       1.17

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.15   FLOOD WIDTH(FEET) =   23.91
FLOW VELOCITY(FEET/SEC.) =   0.76   DEPTH*VELOCITY(FT*FT/SEC) =   0.12
LONGEST FLOWPATH FROM NODE     25.00 TO NODE     24.00 =   170.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   9.74
RAINFALL INTENSITY(INCH/HR) =   3.77
TOTAL STREAM AREA(ACRES) =     0.61
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.17

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1       18.67    27.18       1.945         22.52
    2        1.17     9.74       3.770          0.61

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1       10.81     9.74       3.770
    2       19.28    27.18       1.945

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     19.28   Tc(MIN.) =   27.18
TOTAL AREA(ACRES) =     23.13
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     24.00 =  1539.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1414.25  DOWNSTREAM(FEET) =  1413.65
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.08
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     19.28
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =  27.51
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     27.00 =  1659.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  27.51
  RAINFALL INTENSITY(INCH/HR) =   1.93
  TOTAL STREAM AREA(ACRES) =    23.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     19.28

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     29.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =   1421.34
  DOWNSTREAM ELEVATION(FEET) =   1420.97
  ELEVATION DIFFERENCE(FEET) =      0.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.537
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.448
  SUBAREA RUNOFF(CFS) =      0.53
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.53

****************************************************************************
  FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.97
  DOWNSTREAM NODE ELEVATION(FEET) =   1419.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    96.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.776
```

```
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.73
  AVERAGE FLOW DEPTH(FEET) =   0.15   FLOOD WIDTH(FEET) =   22.44
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.18   Tc(MIN.) =   9.72
  SUBAREA AREA(ACRES) =    0.54       SUBAREA RUNOFF(CFS) =    0.94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.504
  TOTAL AREA(ACRES) =      0.73         PEAK FLOW RATE(CFS) =       1.39

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOOD WIDTH(FEET) =   25.75
  FLOW VELOCITY(FEET/SEC.) =   0.79   DEPTH*VELOCITY(FT*FT/SEC) =   0.13
  LONGEST FLOWPATH FROM NODE     28.00 TO NODE     30.00 =   170.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     27.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1415.75  DOWNSTREAM(FEET) =  1413.65
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   5.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.05
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      1.39
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =  10.11
  LONGEST FLOWPATH FROM NODE     28.00 TO NODE     27.00 =   290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  10.11
  RAINFALL INTENSITY(INCH/HR) =   3.68
  TOTAL STREAM AREA(ACRES) =     0.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.39
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =   1420.60
  DOWNSTREAM ELEVATION(FEET) =   1420.10
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.982
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.163
  SUBAREA RUNOFF(CFS) =      0.16
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.16

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     27.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1420.10  DOWNSTREAM ELEVATION(FEET) = 1418.90
  STREET LENGTH(FEET) =   146.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    6.98
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.57
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.25
  STREET FLOW TRAVEL TIME(MIN.) =   1.55   Tc(MIN.) =   7.54
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.449
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.472
  SUBAREA AREA(ACRES) =    0.64      SUBAREA RUNOFF(CFS) =    1.31
  TOTAL AREA(ACRES) =      0.69        PEAK FLOW RATE(CFS) =       1.45

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.20   HALFSTREET FLOOD WIDTH(FEET) =   8.77
  FLOW VELOCITY(FEET/SEC.) =  1.79   DEPTH*VELOCITY(FT*FT/SEC.) =   0.35
  LONGEST FLOWPATH FROM NODE     31.00 TO NODE     27.00 =   196.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   7.54
  RAINFALL INTENSITY(INCH/HR) =   4.45
  TOTAL STREAM AREA(ACRES) =     0.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.45

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
      1       19.28    27.51        1.930        23.13
      2        1.39    10.11        3.680         0.73
      3        1.45     7.54        4.449         0.69

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.85     7.54       4.449
      2       12.70    10.11       3.680
      3       20.64    27.51       1.930

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     20.64   Tc(MIN.) =   27.51
  TOTAL AREA(ACRES) =     24.55
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     27.00 =  1659.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     33.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1413.65  DOWNSTREAM(FEET) =  1413.00
  FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.12
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     20.64
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =  27.86
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     33.00 =  1789.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  27.86
  RAINFALL INTENSITY(INCH/HR) =   1.91
  TOTAL STREAM AREA(ACRES) =    24.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     20.64

****************************************************************************
  FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =   1420.50
  DOWNSTREAM ELEVATION(FEET) =   1419.75
  ELEVATION DIFFERENCE(FEET) =      0.75
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.801
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.753
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     33.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1419.75
  DOWNSTREAM NODE ELEVATION(FEET) =   1417.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   103.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.205
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.21
  AVERAGE FLOW DEPTH(FEET) =   0.20   FLOOD WIDTH(FEET) =    5.00
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.42   Tc(MIN.) =   8.22
  SUBAREA AREA(ACRES) =    0.35       SUBAREA RUNOFF(CFS) =    0.93
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  TOTAL AREA(ACRES) =      0.39         PEAK FLOW RATE(CFS) =       1.03

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOOD WIDTH(FEET) =    6.80
  FLOW VELOCITY(FEET/SEC.) =   1.46   DEPTH*VELOCITY(FT*FT/SEC) =   0.35
  LONGEST FLOWPATH FROM NODE     34.00 TO NODE     33.00 =   177.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.22
  RAINFALL INTENSITY(INCH/HR) =   4.21
  TOTAL STREAM AREA(ACRES) =     0.39
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.03

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
      1       20.64    27.86       1.914        24.55
      2        1.03     8.22       4.205         0.39

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       10.43     8.22       4.205
      2       21.11    27.86       1.914

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     21.11   Tc(MIN.) =   27.86
  TOTAL AREA(ACRES) =     24.94
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     33.00 =  1789.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1413.00  DOWNSTREAM(FEET) =  1412.65
  FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  21.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.12
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     21.11
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =  28.05
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     36.00 =  1859.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  28.05
  RAINFALL INTENSITY(INCH/HR) =   1.91
  TOTAL STREAM AREA(ACRES) =    24.94
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.11

****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     38.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =   1420.50
  DOWNSTREAM ELEVATION(FEET) =   1419.75
  ELEVATION DIFFERENCE(FEET) =      0.75
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.761
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.771
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     36.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1419.75
  DOWNSTREAM NODE ELEVATION(FEET) =   1417.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   194.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.787
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.87
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.11
  AVERAGE FLOW DEPTH(FEET) =   0.25   FLOOD WIDTH(FEET) =    7.90
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.91   Tc(MIN.) =   9.67
  SUBAREA AREA(ACRES) =    0.64       SUBAREA RUNOFF(CFS) =    1.53
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  TOTAL AREA(ACRES) =      0.68         PEAK FLOW RATE(CFS) =       1.61

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.30   FLOOD WIDTH(FEET) =   13.26
  FLOW VELOCITY(FEET/SEC.) =   1.19   DEPTH*VELOCITY(FT*FT/SEC) =   0.36
  LONGEST FLOWPATH FROM NODE     37.00 TO NODE     36.00 =   266.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.67
  RAINFALL INTENSITY(INCH/HR) =    3.79
  TOTAL STREAM AREA(ACRES) =      0.68
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.61

  ** CONFLUENCE DATA **
  STREAM      RUNOFF       Tc       INTENSITY      AREA
  NUMBER       (CFS)     (MIN.)    (INCH/HOUR)    (ACRE)
      1        21.11     28.05        1.906         24.94
      2         1.61      9.67        3.787          0.68

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

  ** PEAK FLOW RATE TABLE **
  STREAM      RUNOFF       Tc       INTENSITY
  NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
      1        12.23      9.67       3.787
      2        21.92     28.05       1.906

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      21.92   Tc(MIN.) =   28.05
  TOTAL AREA(ACRES) =      25.61
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     36.00 =  1859.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     39.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1412.65  DOWNSTREAM(FEET) =  1412.20
  FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.92
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =  28.29
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     39.00 =  1949.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     39.00 TO NODE     40.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1412.40
  DOWNSTREAM NODE ELEVATION(FEET) =   1409.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   295.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.200   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.788
  LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  80
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     22.39
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.83
  AVERAGE FLOW DEPTH(FEET) =   1.10   FLOOD WIDTH(FEET) =   44.93
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.68   Tc(MIN.) =  30.97
  SUBAREA AREA(ACRES) =    1.52       SUBAREA RUNOFF(CFS) =    0.95
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.427
  TOTAL AREA(ACRES) =     27.14         PEAK FLOW RATE(CFS) =      21.92

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.09   FLOOD WIDTH(FEET) =   44.42
  FLOW VELOCITY(FEET/SEC.) =   1.83   DEPTH*VELOCITY(FT*FT/SEC) =   2.00
  LONGEST FLOWPATH FROM NODE     3.10 TO NODE     40.00 =  2244.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  30.97
  RAINFALL INTENSITY(INCH/HR) =   1.79
  TOTAL STREAM AREA(ACRES) =    27.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     21.92

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.00
  UPSTREAM ELEVATION(FEET) =   1419.30
  DOWNSTREAM ELEVATION(FEET) =   1418.40
  ELEVATION DIFFERENCE(FEET) =      0.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.787
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.759
  SUBAREA RUNOFF(CFS) =      0.36
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.36
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1418.40  DOWNSTREAM ELEVATION(FEET) = 1412.10
  STREET LENGTH(FEET) =   415.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.68
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.13
    HALFSTREET FLOOD WIDTH(FEET) =    5.66
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.89
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.25
  STREET FLOW TRAVEL TIME(MIN.) =   3.66   Tc(MIN.) =  10.45
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.604
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  SUBAREA AREA(ACRES) =     0.28      SUBAREA RUNOFF(CFS) =     0.64
  TOTAL AREA(ACRES) =       0.40        PEAK FLOW RATE(CFS) =       0.91

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.15   HALFSTREET FLOOD WIDTH(FEET) =   6.35
  FLOW VELOCITY(FEET/SEC.) =  2.05   DEPTH*VELOCITY(FT*FT/SEC.) =   0.30
  LONGEST FLOWPATH FROM NODE     41.00 TO NODE     43.00 =   503.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     43.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1412.10  DOWNSTREAM(FEET) =   1409.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =    71.00   CHANNEL SLOPE =  0.0338
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.443
  LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  80
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.54
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.77
```

```
Tc(MIN.) =  11.21
SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =     0.01
AREA-AVERAGE RUNOFF COEFFICIENT =  0.623
TOTAL AREA(ACRES) =      0.41        PEAK FLOW RATE(CFS) =       0.91

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   1.53
LONGEST FLOWPATH FROM NODE     41.00 TO NODE     40.00 =   574.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =  11.21
RAINFALL INTENSITY(INCH/HR) =   3.44
TOTAL STREAM AREA(ACRES) =     0.41
PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.91

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1       21.92    30.97       1.788         27.14
    2        0.91    11.21       3.443          0.41

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1       12.29    11.21       3.443
    2       22.39    30.97       1.788

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     22.39   Tc(MIN.) =   30.97
TOTAL AREA(ACRES) =     27.55
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     40.00 =  2244.00 FEET.
```

NORTH BASIN Q_{DD}

```
============================================================================
SUMMARY:
TOTAL AREA(ACRES)      =    27.55  TC(MIN.) =     30.97
PEAK FLOW RATE(CFS)    =     22.39
FLOW VELOCITY(FEET/SEC.) =   1.53
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     44.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1409.70
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   2.00
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.767
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     22.54
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.90
  AVERAGE FLOW DEPTH(FEET) =   0.62   FLOOD WIDTH(FEET) =   20.96
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.56   Tc(MIN.) =  31.53
  SUBAREA AREA(ACRES) =    0.50       SUBAREA RUNOFF(CFS) =    0.31
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.428
  TOTAL AREA(ACRES) =     28.05         PEAK FLOW RATE(CFS) =      22.39

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.62   FLOOD WIDTH(FEET) =   20.89
  FLOW VELOCITY(FEET/SEC.) =   3.90   DEPTH*VELOCITY(FT*FT/SEC) =   2.41
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  2376.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     44.00 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       22.39    31.53       1.767       28.05
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  2376.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
     1       63.83    26.41       1.981       85.68
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  1134.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1      82.58      26.41       1.981
     2      79.33      31.53       1.767

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     82.58   Tc(MIN.) =   26.41
  TOTAL AREA(ACRES) =    113.73
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1406.10  DOWNSTREAM(FEET) =  1404.70
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  15.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.84
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =     82.58
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =  26.48
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     45.00 =  2431.00 FEET.
```

Q_{EE}

```
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =    113.73  TC(MIN.) =     26.48
  PEAK FLOW RATE(CFS)    =     82.58
  FLOW VELOCITY(FEET/SEC.) =  13.84
============================================================================
============================================================================
  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 1982-2005 Advanced Engineering Software (aes)
            Ver. 2.0 Release Date: 06/01/2005  License ID 1305

                          Analysis prepared by:

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                         La Mesa, CA  91942-2910
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 ************************** DESCRIPTION OF STUDY **************************
* SPIRIT OF JOY CHURCH POST-DEVELOPMENT STUDY - 100 YEAR                   *
* MUP P08-017, ER 08-09-005                                                *
* RAMONA, CALIFORNIA                                                       *
 ***************************************************************************

  FILE NAME: RA027P01.DAT
  TIME/DATE OF STUDY: 10:28 09/07/2012
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  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     10.0    0.020/0.020/0.020   0.50    2.00 0.0200 0.040 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 = 10.0 (FT*FT/S)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*
```

SOUTH BASIN

```
****************************************************************************
  FLOW PROCESS FROM NODE       4.00 TO NODE       4.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  21.43   RAIN INTENSITY(INCH/HOUR) =  3.61
  TOTAL AREA(ACRES) =     81.06   TOTAL RUNOFF(CFS) =     104.02

****************************************************************************
  FLOW PROCESS FROM NODE       4.00 TO NODE       3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1418.90  DOWNSTREAM(FEET) =   1416.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =     98.00   CHANNEL SLOPE =  0.0255
  CHANNEL BASE(FEET) =     7.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.594
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     104.03
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.88
  AVERAGE FLOW DEPTH(FEET) =   1.07   TRAVEL TIME(MIN.) =   0.12
  Tc(MIN.) =  21.55
  SUBAREA AREA(ACRES) =      0.01       SUBAREA RUNOFF(CFS) =     0.01
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.356
  TOTAL AREA(ACRES) =      81.07         PEAK FLOW RATE(CFS) =     104.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.07   FLOW VELOCITY(FEET/SEC.) =  13.88
  LONGEST FLOWPATH FROM NODE       0.00 TO NODE       3.00 =    98.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  21.55
  RAINFALL INTENSITY(INCH/HR) =   3.59
  TOTAL STREAM AREA(ACRES) =    81.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =    104.02
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.20 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) =    65.00
  UPSTREAM ELEVATION(FEET) =   1425.00
  DOWNSTREAM ELEVATION(FEET) =   1422.50
  ELEVATION DIFFERENCE(FEET) =      2.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.947
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.459
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE      3.20 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1422.50  DOWNSTREAM(FEET) =   1420.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0125
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  20.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.518
  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) =      0.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.81
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   4.14
  Tc(MIN.) =  11.08
  SUBAREA AREA(ACRES) =     0.44       SUBAREA RUNOFF(CFS) =    0.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =      0.54         PEAK FLOW RATE(CFS) =       1.04

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   0.94
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      3.00 =   265.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  11.08
  RAINFALL INTENSITY(INCH/HR) =   5.52
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.04
```

```
****************************************************************************
  FLOW PROCESS FROM NODE       6.00 TO NODE       7.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     42.00
  UPSTREAM ELEVATION(FEET) =    1421.75
  DOWNSTREAM ELEVATION(FEET) =    1421.25
  ELEVATION DIFFERENCE(FEET) =       0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     5.173
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.021
  SUBAREA RUNOFF(CFS) =       0.85
  TOTAL AREA(ACRES) =       0.15   TOTAL RUNOFF(CFS) =       0.85

****************************************************************************
  FLOW PROCESS FROM NODE       7.00 TO NODE       3.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1418.00  DOWNSTREAM(FEET) =  1416.40
  FLOW LENGTH(FEET) =    180.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.50
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.85
  PIPE TRAVEL TIME(MIN.) =   0.86    Tc(MIN.) =   6.03
  LONGEST FLOWPATH FROM NODE       6.00 TO NODE       3.00 =   222.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE       3.00 TO NODE       3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   6.03
  RAINFALL INTENSITY(INCH/HR) =   8.17
  TOTAL STREAM AREA(ACRES) =     0.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.85
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      9.00 TO NODE     10.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (4.3 DU/AC OR LESS) RUNOFF COEFFICIENT = .5200
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  86
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =   1421.75
  DOWNSTREAM ELEVATION(FEET) =   1420.90
  ELEVATION DIFFERENCE(FEET) =      0.85
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.735
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.435
  SUBAREA RUNOFF(CFS) =      1.10
  TOTAL AREA(ACRES) =      0.33   TOTAL RUNOFF(CFS) =      1.10

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE      3.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1417.00  DOWNSTREAM(FEET) =  1416.40
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   5.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      1.10
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   8.94
  LONGEST FLOWPATH FROM NODE      9.00 TO NODE      3.00 =   135.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  4
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  4 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.94
  RAINFALL INTENSITY(INCH/HR) =   6.34
  TOTAL STREAM AREA(ACRES) =     0.33
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.10

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1       104.02    21.55       3.594        81.07
     2         1.04    11.08       5.518         0.54
     3         0.85     6.03       8.172         0.15
     4         1.10     8.94       6.341         0.33

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

  ** PEAK FLOW RATE TABLE **
```

```
STREAM      RUNOFF      Tc       INTENSITY
NUMBER      (CFS)     (MIN.)    (INCH/HOUR)
   1        31.28      6.03       8.172
   2        45.74      8.94       6.341
   3        56.09     11.08       5.518
   4       105.70     21.55       3.594

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =    105.70   Tc(MIN.) =   21.55
TOTAL AREA(ACRES) =      82.09
LONGEST FLOWPATH FROM NODE      3.10 TO NODE      3.00 =   265.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE      3.00 TO NODE     11.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1416.40  DOWNSTREAM(FEET) =   1410.70
CHANNEL LENGTH THRU SUBAREA(FEET) =   604.00   CHANNEL SLOPE =  0.0094
CHANNEL BASE(FEET) =    6.00   "Z" FACTOR =   2.000
MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   5.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.378
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    108.17
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.64
AVERAGE FLOW DEPTH(FEET) =   2.23   TRAVEL TIME(MIN.) =   2.17
Tc(MIN.) =  23.72
SUBAREA AREA(ACRES) =     2.32       SUBAREA RUNOFF(CFS) =    4.94
AREA-AVERAGE RUNOFF COEFFICIENT =  0.364
TOTAL AREA(ACRES) =     84.41         PEAK FLOW RATE(CFS) =     105.70

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  2.20   FLOW VELOCITY(FEET/SEC.) =   4.61
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     11.00 =   869.00 FEET.
```

SOUTH BASIN Q_{CC}

```
============================================================================
SUMMARY:
TOTAL AREA(ACRES)      =    84.41  TC(MIN.) =     23.72
PEAK FLOW RATE(CFS)    =     105.70
PEAK FLOW VELOCITY(FEET/SEC.) =   4.61
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     44.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1410.70
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   265.00
  "V" GUTTER WIDTH(FEET) =   2.00   GUTTER HIKE(FEET) =  0.500
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.20000
  MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.316
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =    106.44
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.35
  AVERAGE FLOW DEPTH(FEET) =   2.20   FLOOD WIDTH(FEET) =   18.03
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.70   Tc(MIN.) =  24.41
  SUBAREA AREA(ACRES) =    1.27       SUBAREA RUNOFF(CFS) =    1.47
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.364
  TOTAL AREA(ACRES) =     85.68         PEAK FLOW RATE(CFS) =     105.70

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  2.20   FLOOD WIDTH(FEET) =   17.99
  FLOW VELOCITY(FEET/SEC.) =   6.34   DEPTH*VELOCITY(FT*FT/SEC) =  13.93
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  1134.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     44.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================
```

NORTH BASIN

```
****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      1.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  24.47   RAIN INTENSITY(INCH/HOUR) =  3.31
  TOTAL AREA(ACRES) =    19.83   TOTAL RUNOFF(CFS) =     26.92

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1419.20  DOWNSTREAM(FEET) =  1418.60
  FLOW LENGTH(FEET) =    60.00   MANNING'S N =  0.015
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.23
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     26.92
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =  24.54
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      2.00 =  1194.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  24.54
  RAINFALL INTENSITY(INCH/HR) =   3.31
  TOTAL STREAM AREA(ACRES) =    19.83
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     26.92

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    45.00
  UPSTREAM ELEVATION(FEET) =   1421.75
  DOWNSTREAM ELEVATION(FEET) =   1420.90
  ELEVATION DIFFERENCE(FEET) =      0.85
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.740
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.606
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.25
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.20 TO NODE      2.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1420.90  DOWNSTREAM(FEET) =   1418.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   240.00   CHANNEL SLOPE =  0.0096
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  40.000
  MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.514
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  82
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.56
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.92
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   4.36
  Tc(MIN.) =  11.10
  SUBAREA AREA(ACRES) =     2.00       SUBAREA RUNOFF(CFS) =    4.52
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
  TOTAL AREA(ACRES) =      2.08         PEAK FLOW RATE(CFS) =       4.70

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.27   FLOW VELOCITY(FEET/SEC.) =   1.09
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.00 =   285.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  11.10
  RAINFALL INTENSITY(INCH/HR) =   5.51
  TOTAL STREAM AREA(ACRES) =     2.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.70
  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1       26.92    24.54        3.305         19.83
     2        4.70    11.10        5.514          2.08

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       16.88    11.10       5.514
     2       29.74    24.54       3.305

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     29.74   Tc(MIN.) =   24.54
  TOTAL AREA(ACRES) =     21.91
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      2.00 =  1194.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE     23.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1416.00  DOWNSTREAM(FEET) =  1415.15
  FLOW LENGTH(FEET) =   160.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.01
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     29.74
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =  24.92
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     23.00 =  1354.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  24.92
  RAINFALL INTENSITY(INCH/HR) =   3.27
  TOTAL STREAM AREA(ACRES) =    21.91
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     29.74

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    51.00
  UPSTREAM ELEVATION(FEET) =   1420.80
  DOWNSTREAM ELEVATION(FEET) =   1420.20
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.723
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.452
  SUBAREA RUNOFF(CFS) =      0.27
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.27

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     23.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.20
  DOWNSTREAM NODE ELEVATION(FEET) =   1418.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =    91.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0200
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   1.00
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.710
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.63
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.73
AVERAGE FLOW DEPTH(FEET) =   0.14   FLOOD WIDTH(FEET) =   13.35
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.88   Tc(MIN.) =   6.60
SUBAREA AREA(ACRES) =    0.56       SUBAREA RUNOFF(CFS) =    2.72
AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
TOTAL AREA(ACRES) =      0.61         PEAK FLOW RATE(CFS) =       2.96

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.18   FLOOD WIDTH(FEET) =   17.03
FLOW VELOCITY(FEET/SEC.) =   1.98   DEPTH*VELOCITY(FT*FT/SEC) =   0.36
LONGEST FLOWPATH FROM NODE     21.00 TO NODE     23.00 =   142.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     23.00 TO NODE     23.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   6.60
RAINFALL INTENSITY(INCH/HR) =   7.71
TOTAL STREAM AREA(ACRES) =     0.61
PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.96

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1       29.74    24.92       3.273        21.91
    2        2.96     6.60       7.710         0.61

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1       15.59     6.60       7.710
    2       31.00    24.92       3.273

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     31.00   Tc(MIN.) =   24.92
TOTAL AREA(ACRES) =     22.52
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     23.00 =  1354.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     23.00 TO NODE     24.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1415.15  DOWNSTREAM(FEET) =  1414.25
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.81
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     31.00
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =  25.37
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     24.00 =  1539.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  25.37
  RAINFALL INTENSITY(INCH/HR) =   3.23
  TOTAL STREAM AREA(ACRES) =    22.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     31.00

****************************************************************************
  FLOW PROCESS FROM NODE     25.00 TO NODE     26.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =   1421.34
  DOWNSTREAM ELEVATION(FEET) =   1420.97
  ELEVATION DIFFERENCE(FEET) =      0.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.537
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.077
  SUBAREA RUNOFF(CFS) =      0.80
  TOTAL AREA(ACRES) =      0.18   TOTAL RUNOFF(CFS) =      0.80

****************************************************************************
  FLOW PROCESS FROM NODE     26.00 TO NODE     24.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.97
  DOWNSTREAM NODE ELEVATION(FEET) =   1419.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    96.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.075
```

```
RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  84
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.41
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.80
AVERAGE FLOW DEPTH(FEET) =   0.16   FLOOD WIDTH(FEET) =   25.75
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.01   Tc(MIN.) =   9.55
SUBAREA AREA(ACRES) =    0.43       SUBAREA RUNOFF(CFS) =    1.20
AREA-AVERAGE RUNOFF COEFFICIENT =  0.510
TOTAL AREA(ACRES) =      0.61         PEAK FLOW RATE(CFS) =       1.89

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.18   FLOOD WIDTH(FEET) =   29.05
FLOW VELOCITY(FEET/SEC.) =   0.85   DEPTH*VELOCITY(FT*FT/SEC) =   0.15
LONGEST FLOWPATH FROM NODE     25.00 TO NODE     24.00 =   170.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     24.00 TO NODE     24.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   9.55
RAINFALL INTENSITY(INCH/HR) =   6.08
TOTAL STREAM AREA(ACRES) =     0.61
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.89

** CONFLUENCE DATA **
STREAM     RUNOFF      Tc      INTENSITY      AREA
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
    1       31.00    25.37       3.235        22.52
    2        1.89     9.55       6.075         0.61

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

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1       18.40     9.55       6.075
    2       32.00    25.37       3.235

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     32.00   Tc(MIN.) =   25.37
TOTAL AREA(ACRES) =     23.13
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     24.00 =  1539.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     24.00 TO NODE     27.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1414.25  DOWNSTREAM(FEET) =  1413.65
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.92
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =     32.00
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =  25.66
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     27.00 =  1659.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  25.66
  RAINFALL INTENSITY(INCH/HR) =   3.21
  TOTAL STREAM AREA(ACRES) =    23.13
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     32.00

****************************************************************************
  FLOW PROCESS FROM NODE     28.00 TO NODE     29.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =   1421.34
  DOWNSTREAM ELEVATION(FEET) =   1420.97
  ELEVATION DIFFERENCE(FEET) =      0.37
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.537
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.077
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.19   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE     29.00 TO NODE     30.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1420.97
  DOWNSTREAM NODE ELEVATION(FEET) =   1419.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    96.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.01000
  MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.100
```

```
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.61
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.82
  AVERAGE FLOW DEPTH(FEET) =   0.17   FLOOD WIDTH(FEET) =   27.21
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.95   Tc(MIN.) =   9.49
  SUBAREA AREA(ACRES) =    0.54       SUBAREA RUNOFF(CFS) =    1.52
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.504
  TOTAL AREA(ACRES) =      0.73         PEAK FLOW RATE(CFS) =       2.25

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOOD WIDTH(FEET) =   31.25
  FLOW VELOCITY(FEET/SEC.) =   0.88   DEPTH*VELOCITY(FT*FT/SEC) =   0.17
  LONGEST FLOWPATH FROM NODE     28.00 TO NODE     30.00 =   170.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     27.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1415.75  DOWNSTREAM(FEET) =  1413.65
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  (PIPE FLOW VELOCITY CORRESPONDING TO NORMAL-DEPTH FLOW
   AT DEPTH = 0.94 * DIAMETER)
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      2.25
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =   9.90
  LONGEST FLOWPATH FROM NODE     28.00 TO NODE     27.00 =   290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   9.90
  RAINFALL INTENSITY(INCH/HR) =   5.94
  TOTAL STREAM AREA(ACRES) =     0.73
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.25

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =   1420.60
  DOWNSTREAM ELEVATION(FEET) =   1420.10
  ELEVATION DIFFERENCE(FEET) =      0.50
```

```
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =     5.982
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.214
  SUBAREA RUNOFF(CFS) =       0.26
  TOTAL AREA(ACRES) =       0.05   TOTAL RUNOFF(CFS) =       0.26

****************************************************************************
  FLOW PROCESS FROM NODE     32.00 TO NODE     27.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1420.10  DOWNSTREAM ELEVATION(FEET) = 1418.90
  STREET LENGTH(FEET) =   146.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.33
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.19
    HALFSTREET FLOOD WIDTH(FEET) =    8.46
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.76
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.33
  STREET FLOW TRAVEL TIME(MIN.) =   1.39   Tc(MIN.) =   7.37
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.181
  RESIDENTIAL (2. DU/AC OR LESS) RUNOFF COEFFICIENT = .4600
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.472
  SUBAREA AREA(ACRES) =     0.64      SUBAREA RUNOFF(CFS) =     2.11
  TOTAL AREA(ACRES) =       0.69        PEAK FLOW RATE(CFS) =       2.34

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.23   HALFSTREET FLOOD WIDTH(FEET) =  10.57
  FLOW VELOCITY(FEET/SEC.) =  2.02   DEPTH*VELOCITY(FT*FT/SEC.) =   0.47
  LONGEST FLOWPATH FROM NODE     31.00 TO NODE     27.00 =   196.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     27.00 TO NODE     27.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   7.37
  RAINFALL INTENSITY(INCH/HR) =   7.18
  TOTAL STREAM AREA(ACRES) =     0.69
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.34
```

```
** CONFLUENCE DATA **
STREAM      RUNOFF      Tc       INTENSITY      AREA
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
    1        32.00    25.66        3.211        23.13
    2         2.25     9.90        5.937         0.73
    3         2.34     7.37        7.181         0.69

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

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc       INTENSITY
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)
    1        18.32     7.37       7.181
    2        21.49     9.90       5.937
    3        34.26    25.66       3.211

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     34.26   Tc(MIN.) =   25.66
TOTAL AREA(ACRES) =     24.55
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     27.00 =  1659.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     27.00 TO NODE     33.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  1413.65  DOWNSTREAM(FEET) =  1413.00
FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.98
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     34.26
PIPE TRAVEL TIME(MIN.) =   0.31    Tc(MIN.) =  25.97
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     33.00 =  1789.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =  25.97
RAINFALL INTENSITY(INCH/HR) =   3.19
TOTAL STREAM AREA(ACRES) =    24.55
PEAK FLOW RATE(CFS) AT CONFLUENCE =     34.26
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     34.00 TO NODE     35.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
  UPSTREAM ELEVATION(FEET) =   1420.50
  DOWNSTREAM ELEVATION(FEET) =   1419.75
  ELEVATION DIFFERENCE(FEET) =      0.75
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.801
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.562
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE     35.00 TO NODE     33.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1419.75
  DOWNSTREAM NODE ELEVATION(FEET) =   1417.40
  CHANNEL LENGTH THRU SUBAREA(FEET) =   103.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.804
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      0.94
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.42
  AVERAGE FLOW DEPTH(FEET) =   0.23   FLOOD WIDTH(FEET) =    6.15
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.21   Tc(MIN.) =   8.01
  SUBAREA AREA(ACRES) =    0.35       SUBAREA RUNOFF(CFS) =    1.50
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  TOTAL AREA(ACRES) =      0.39         PEAK FLOW RATE(CFS) =       1.67

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOOD WIDTH(FEET) =   10.85
  FLOW VELOCITY(FEET/SEC.) =   1.57   DEPTH*VELOCITY(FT*FT/SEC) =   0.44
  LONGEST FLOWPATH FROM NODE     34.00 TO NODE     33.00 =   177.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     33.00 TO NODE     33.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   8.01
  RAINFALL INTENSITY(INCH/HR) =   6.80
  TOTAL STREAM AREA(ACRES) =     0.39
```

```
PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.67

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc       INTENSITY      AREA
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
    1        34.26    25.97        3.187        24.55
    2         1.67     8.01        6.804         0.39

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

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc       INTENSITY
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)
    1        17.72     8.01       6.804
    2        35.05    25.97       3.187

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     35.05   Tc(MIN.) =   25.97
TOTAL AREA(ACRES) =     24.94
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     33.00 =  1789.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     33.00 TO NODE     36.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  1413.00  DOWNSTREAM(FEET) =  1412.65
FLOW LENGTH(FEET) =    70.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   6.99
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     35.05
PIPE TRAVEL TIME(MIN.) =   0.17    Tc(MIN.) =  26.14
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     36.00 =  1859.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
TIME OF CONCENTRATION(MIN.) =  26.14
RAINFALL INTENSITY(INCH/HR) =   3.17
TOTAL STREAM AREA(ACRES) =    24.94
PEAK FLOW RATE(CFS) AT CONFLUENCE =     35.05
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     37.00 TO NODE     38.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =   1420.50
  DOWNSTREAM ELEVATION(FEET) =   1419.75
  ELEVATION DIFFERENCE(FEET) =      0.75
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.761
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.591
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE     38.00 TO NODE     36.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1419.75
  DOWNSTREAM NODE ELEVATION(FEET) =   1417.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   194.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0400
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.093
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.18
  AVERAGE FLOW DEPTH(FEET) =   0.29   FLOOD WIDTH(FEET) =   11.95
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.74   Tc(MIN.) =   9.50
  SUBAREA AREA(ACRES) =    0.64       SUBAREA RUNOFF(CFS) =    2.46
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
  TOTAL AREA(ACRES) =      0.68         PEAK FLOW RATE(CFS) =       2.59

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOOD WIDTH(FEET) =   17.85
  FLOW VELOCITY(FEET/SEC.) =   1.25   DEPTH*VELOCITY(FT*FT/SEC) =   0.44
  LONGEST FLOWPATH FROM NODE     37.00 TO NODE     36.00 =   266.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     36.00 TO NODE     36.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   9.50
  RAINFALL INTENSITY(INCH/HR) =   6.09
  TOTAL STREAM AREA(ACRES) =     0.68
```

```
PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.59

** CONFLUENCE DATA **
STREAM      RUNOFF      Tc       INTENSITY      AREA
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)    (ACRE)
    1        35.05    26.14        3.173         24.94
    2         2.59     9.50        6.093          0.68

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

** PEAK FLOW RATE TABLE **
STREAM      RUNOFF      Tc       INTENSITY
NUMBER       (CFS)    (MIN.)    (INCH/HOUR)
    1        20.84     9.50       6.093
    2        36.40    26.14       3.173

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =     36.40   Tc(MIN.) =   26.14
TOTAL AREA(ACRES) =     25.61
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     36.00 =  1859.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     36.00 TO NODE     39.00 IS CODE =  31
----------------------------------------------------------------------------
>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =  1412.65  DOWNSTREAM(FEET) =  1412.20
FLOW LENGTH(FEET) =    90.00   MANNING'S N =  0.013
DEPTH OF FLOW IN  33.0 INCH PIPE IS  27.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) =   7.00
ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
PIPE-FLOW(CFS) =     36.40
PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =  26.35
LONGEST FLOWPATH FROM NODE      3.10 TO NODE     39.00 =  1949.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     39.00 TO NODE     40.00 IS CODE =  91
----------------------------------------------------------------------------
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
UPSTREAM NODE ELEVATION(FEET) =   1412.40
DOWNSTREAM NODE ELEVATION(FEET) =   1409.70
CHANNEL LENGTH THRU SUBAREA(FEET) =   295.00
"V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.500
PAVEMENT LIP(FEET) =  0.200   MANNING'S N = .0400
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) =   2.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.975
LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  80
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     37.19
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.94
AVERAGE FLOW DEPTH(FEET) =   1.23   FLOOD WIDTH(FEET) =   58.38
"V" GUTTER FLOW TRAVEL TIME(MIN.) =   2.53   Tc(MIN.) =  28.88
```

```
  SUBAREA AREA(ACRES) =     1.52        SUBAREA RUNOFF(CFS) =     1.58
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.427
  TOTAL AREA(ACRES) =      27.14          PEAK FLOW RATE(CFS) =       36.40

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  1.23   FLOOD WIDTH(FEET) =   57.75
  FLOW VELOCITY(FEET/SEC.) =   1.94   DEPTH*VELOCITY(FT*FT/SEC) =   2.38
  LONGEST FLOWPATH FROM NODE       3.10 TO NODE      40.00 =  2244.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =  28.88
  RAINFALL INTENSITY(INCH/HR) =   2.98
  TOTAL STREAM AREA(ACRES) =    27.14
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     36.40

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  89
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.00
  UPSTREAM ELEVATION(FEET) =   1419.30
  DOWNSTREAM ELEVATION(FEET) =   1418.40
  ELEVATION DIFFERENCE(FEET) =      0.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.787
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.572
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE     42.00 TO NODE     43.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1418.40  DOWNSTREAM ELEVATION(FEET) = 1412.10
  STREET LENGTH(FEET) =   415.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 16.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  10.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200
```

```
  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.09
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.16
  HALFSTREET FLOOD WIDTH(FEET) =    6.90
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.12
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.33
STREET FLOW TRAVEL TIME(MIN.) =   3.26   Tc(MIN.) =  10.05
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.878
RESIDENTAIL (14.5 DU/AC OR LESS) RUNOFF COEFFICIENT = .6300
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  89
AREA-AVERAGE RUNOFF COEFFICIENT =  0.630
SUBAREA AREA(ACRES) =     0.28      SUBAREA RUNOFF(CFS) =     1.04
TOTAL AREA(ACRES) =       0.40        PEAK FLOW RATE(CFS) =       1.48

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.18   HALFSTREET FLOOD WIDTH(FEET) =   7.84
FLOW VELOCITY(FEET/SEC.) =  2.26   DEPTH*VELOCITY(FT*FT/SEC.) =   0.40
LONGEST FLOWPATH FROM NODE     41.00 TO NODE     43.00 =   503.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE     43.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
>>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =   1412.10  DOWNSTREAM(FEET) =   1409.70
CHANNEL LENGTH THRU SUBAREA(FEET) =    71.00   CHANNEL SLOPE =  0.0338
CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =  10.000
MANNING'S FACTOR = 0.040   MAXIMUM DEPTH(FEET) =   1.00
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.645
LAWNS, GOLF COURSES, ETC. GOOD COVER RUNOFF COEFFICIENT = .3500
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  80
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.49
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.82
AVERAGE FLOW DEPTH(FEET) =   0.20   TRAVEL TIME(MIN.) =   0.65
Tc(MIN.) =  10.70
SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.02
AREA-AVERAGE RUNOFF COEFFICIENT =  0.623
TOTAL AREA(ACRES) =       0.41         PEAK FLOW RATE(CFS) =      1.48

END OF SUBAREA CHANNEL FLOW HYDRAULICS:
DEPTH(FEET) =  0.20   FLOW VELOCITY(FEET/SEC.) =   1.81
LONGEST FLOWPATH FROM NODE     41.00 TO NODE     40.00 =   574.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =  10.70
  RAINFALL INTENSITY(INCH/HR) =   5.65
  TOTAL STREAM AREA(ACRES) =     0.41
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.48

  ** CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY      AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)    (ACRE)
     1       36.40    28.88        2.975        27.14
     2        1.48    10.70        5.645         0.41

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       20.66    10.70       5.645
     2       37.18    28.88       2.975

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =     37.18   Tc(MIN.) =   28.88
  TOTAL AREA(ACRES) =     27.55
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     40.00 =  2244.00 FEET.
```

NORTH BASIN Q_{DD}

```
============================================================================
  SUMMARY:
  TOTAL AREA(ACRES)      =    27.55  TC(MIN.) =     28.88
  PEAK FLOW RATE(CFS)    =    37.18
  PEAK FLOW VELOCITY(FEET/SEC.) =   1.81
============================================================================
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     44.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1409.70
  DOWNSTREAM NODE ELEVATION(FEET) =   1406.10
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00
  "V" GUTTER WIDTH(FEET) =   5.00   GUTTER HIKE(FEET) =  0.200
  PAVEMENT LIP(FEET) =  0.020   MANNING'S N = .0300
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.05000
  MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.942
  PASTURE OR RANGE LAND FAIR COVER RUNOFF COEFFICIENT = .3500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  84
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =     37.43
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.34
  AVERAGE FLOW DEPTH(FEET) =   0.74   FLOOD WIDTH(FEET) =   25.82
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   0.51   Tc(MIN.) =  29.39
  SUBAREA AREA(ACRES) =    0.50       SUBAREA RUNOFF(CFS) =    0.51
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.428
  TOTAL AREA(ACRES) =     28.05         PEAK FLOW RATE(CFS) =      37.18

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.74   FLOOD WIDTH(FEET) =   25.76
  FLOW VELOCITY(FEET/SEC.) =   4.33   DEPTH*VELOCITY(FT*FT/SEC) =   3.20
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  2376.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     44.00 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       37.18    29.39       2.942       28.05
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  2376.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF     Tc      INTENSITY     AREA
  NUMBER      (CFS)   (MIN.)   (INCH/HOUR)   (ACRE)
     1      105.70    24.41       3.316       85.68
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     44.00 =  1134.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1     136.58      24.41       3.316
     2     130.96      29.39       2.942

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =    136.58   Tc(MIN.) =   24.41
  TOTAL AREA(ACRES) =    113.73
```

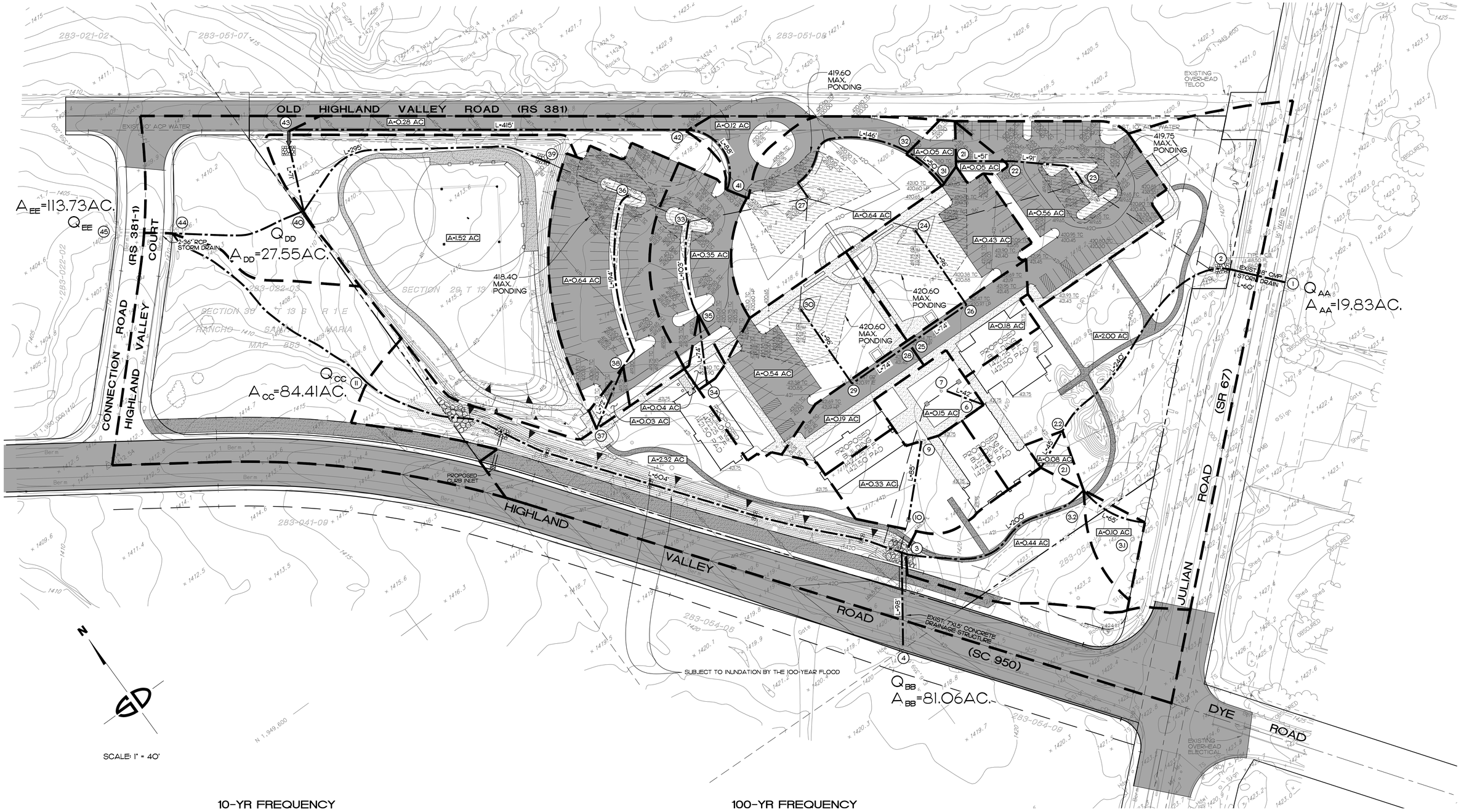
```
****************************************************************************
  FLOW PROCESS FROM NODE     44.00 TO NODE     45.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1406.10  DOWNSTREAM(FEET) =  1404.70
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  21.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.67
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =    136.58
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =  24.47
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE     45.00 =  2431.00 FEET.
```

Q_{EE}

```
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =    113.73  TC(MIN.) =      24.47
  PEAK FLOW RATE(CFS)    =    136.58
  FLOW VELOCITY(FEET/SEC.) =  15.67
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

SPIRIT OF JOY LUTHERAN CHURCH

POST DEVELOPMENT DRAINAGE MAP



10-YR FREQUENCY

	PRE-DEVELOPMENT				POST-DEVELOPMENT			
BASIN	AREA (AC.)	Q (CFS)	T_C (MIN.)	V (FPS)	AREA (AC.)	Q (CFS)	T_C (MIN.)	V (FPS)
Q_{AA} (IN)	19.83	16.22	26.12	9.18	19.83	16.22	26.12	9.18
Q_{BB} (IN)	81.06	62.82	23.00	13.46	81.06	62.82	23.00	11.69
Q_{CC} (OUT)	109.49	79.60	25.74	4.53	84.41	63.83	25.63	4.01
Q_{DD} (OUT)	2.47	2.30	16.74	2.13	27.55	*22.39	30.97	1.53
Q_{EE} (OUT)	113.73	81.64	26.74	13.80	113.73	*82.58	26.48	13.84
TOTAL: (Q_{EE})	113.73	81.64	26.74	13.80	113.73	77.96	26.33	13.84

100-YR FREQUENCY

	PRE-DEVELOPMENT				POST-DEVELOPMENT			
BASIN	AREA (AC.)	Q (CFS)	T_C (MIN.)	V (FPS)	AREA (AC.)	Q (CFS)	T_C (MIN.)	V (FPS)
Q_{AA} (IN)	19.83	26.92	24.47	15.23	19.83	26.92	24.47	15.23
Q_{BB} (IN)	81.06	104.02	21.43	16.05	81.06	104.02	21.43	13.88
Q_{CC} (OUT)	109.49	132.85	23.90	5.10	84.41	105.70	23.72	4.61
Q_{DD} (OUT)	2.47	3.75	16.10	2.35	27.55	*37.18	28.88	1.81
Q_{EE} (OUT)	113.73	136.27	24.79	15.66	113.73	*136.58	24.47	15.67
TOTAL: (Q_{EE})	113.73	136.27	24.79	15.66	113.73	126.75	24.33	15.67

* THESE RUNOFF VOLUMES ARE WITHOUT ANY ON-SITE RETENTION. RETENTION SHALL OCCUR AT NODES 23, 24, 30, 27, 33 AND 36 TO MITIGATE THE ADDITIONAL RUNOFF DUE TO DEVELOPMENT AND THE INTRODUCTION OF IMPERVIOUS SURFACES. SEE RETENTION SECTION IN REPORT FOR CALCULATIONS AT EACH OF THESE NODES. THE OUTFLOW FROM EACH CATCH BASIN SHALL BE RESTRICTED UTILIZING A 3" PIPE, THUS CREATING PONDING AT EACH LOCATION.

LEGEND:

ITEM	SYMBOL
BASIN	
NODE	22
FLOW PATH	
LIMITS OF INUNDATION OF 100-YEAR FLOOD	
LIMITS OF RETENTION PONDING	

GRAPHIC SCALE: 40 0 40 80 120

ENGINEER OF WORK

ENGINEER OF WORK
Snipes-Dye associates
civil engineers and land surveyors
8348 CENTER DRIVE, STE. G, LA MESA, CA 91942
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WILLIAM A. SNIPES R.C.E. 50479
EXPIRES 06-30-13
4/1/13

REGISTERED PROFESSIONAL ENGINEER — WILLIAM A. SNIPES — No. 50477 — Exp. 06-30-13 — CIVIL — STATE OF CALIFORNIA

POST DEVELOPMENT DRAINAGE MAP

CONCEPTUAL GRADING PLAN

SPIRIT OF JOY LUTHERAN CHURCH
RAMONA, CALIFORNIA

SHEET TITLE	
JOB NAME	
DESIGNER	WAS
DRAWN	TCT
CHECKED	WAS
DATE	6/12/09

NO	DATE	REVISION DESCRIPTION	BY
1	1/12/11	ADD PONDING LIMITS	SDA
2	9/5/12	REVISE PER UPDATED SITE PLAN	SDA
3	4/1/13	ADD STORM DRAIN PIPE SIZES	SDA

SNIPES-DYE ASSOCIATES
8348 CENTER DRIVE, SUITE 6, LA MESA, CA 91942-2910 (619) 697-9234, FAX (619) 460-2033

SHEET 1 OF 1 SHEETS
JOB NO. 12A0272 (A.9)

S:\SNIPES\12A0272 Highland Valley Rd Spirit Church\Dwg\PLATS-EXHIBITS\POST DEVELOPMENT DRAINAGE.dwg
Thursday, April 04, 2013 10:00:19 by: WAS

POST DEVELOPMENT DRAINAGE MAP

@ WESTERLY PROPERTY LINE

JUST UPSTREAM OF ROCK RIP RAP

```
**************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
--------------------------------------------------------------------------
  CHANNEL Z1(HORIZONTAL/VERTICAL) =   2.00
      Z2(HORIZONTAL/VERTICAL) =   2.00
  BASEWIDTH(FEET) =    6.00
  CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
  UNIFORM FLOW(CFS) =     105.70
  MANNINGS FRICTION FACTOR = 0.0400
==========================================================================
  NORMAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
  >>>>> NORMAL DEPTH(FEET) =  2.17
  FLOW TOP-WIDTH(FEET) =      14.67
  FLOW AREA(SQUARE FEET) =        22.42
  HYDRAULIC DEPTH(FEET) =    1.53
  FLOW AVERAGE VELOCITY(FEET/SEC.) =    4.71
  UNIFORM FROUDE NUMBER =   0.672
  PRESSURE + MOMENTUM(POUNDS) =       2270.49
  AVERAGED VELOCITY HEAD(FEET) =     0.345
  SPECIFIC ENERGY(FEET) =     2.514
==========================================================================
  CRITICAL-DEPTH FLOW INFORMATION:
--------------------------------------------------------------------------
  CRITICAL FLOW TOP-WIDTH(FEET) =      12.97
  CRITICAL FLOW AREA(SQUARE FEET) =        16.52
  CRITICAL FLOW HYDRAULIC DEPTH(FEET) =    1.27
  CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =    6.40
  CRITICAL DEPTH(FEET) =    1.74
  CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =       2098.48
  AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =     0.636
  CRITICAL FLOW SPECIFIC ENERGY(FEET) =     2.378
==========================================================================
```

SNIPES-DYE ASSOCIATES
Civil Engineers & Land Surveyors
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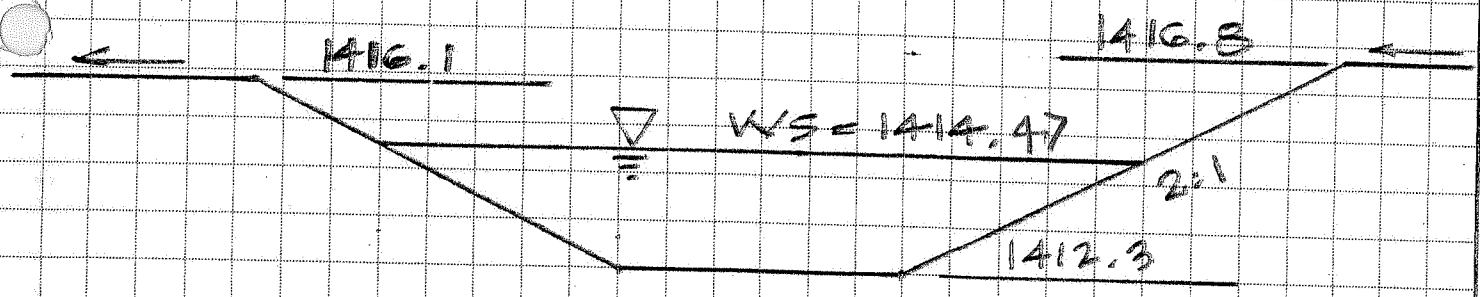
LA MESA, CALIFORNIA 91942-2910
(619) 697-9234 FAX (619) 460-2033

JOB SPIRIT OF JOY
SHEET NO. 4 OF
CALCULATED BY WAS DATE 6/24/08
CHECKED BY DATE
SCALE 1" = 4' REV. 9/10/12

WESTERLY ℄ (JUST UPSTREAM OF ROCK MIP MAP)



V = 4.71 FPS (NON-EROSIVE)

@ NODE 11

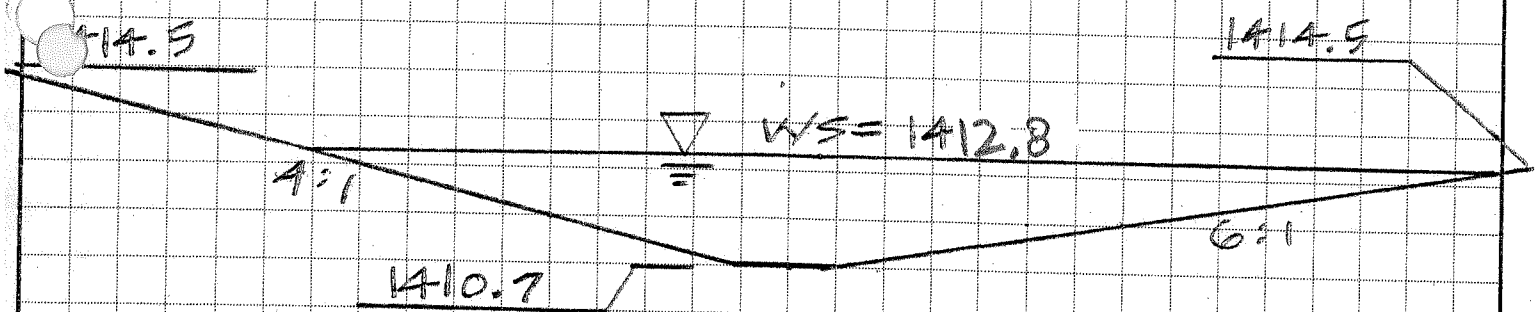
OFF-SITE NATURAL CHANNEL

```
****************************************************************************
>>>>CHANNEL INPUT INFORMATION<<<<
----------------------------------------------------------------------------
   CHANNEL Z1(HORIZONTAL/VERTICAL) =    4.00
        Z2(HORIZONTAL/VERTICAL) =    6.00
   BASEWIDTH(FEET) =     2.00
   CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.010000
   UNIFORM FLOW(CFS) =      105.70
   MANNINGS FRICTION FACTOR = 0.0400
============================================================================
   NORMAL-DEPTH FLOW INFORMATION:
----------------------------------------------------------------------------
   >>>>> NORMAL DEPTH(FEET) =   2.10
   FLOW TOP-WIDTH(FEET) =       23.04
   FLOW AREA(SQUARE FEET) =        26.34
   HYDRAULIC DEPTH(FEET) =    1.14
   FLOW AVERAGE VELOCITY(FEET/SEC.) =    4.01
   UNIFORM FROUDE NUMBER =    0.661
   PRESSURE + MOMENTUM(POUNDS) =        2066.63
   AVERAGED VELOCITY HEAD(FEET) =     0.250
   SPECIFIC ENERGY(FEET) =     2.354
============================================================================
   CRITICAL-DEPTH FLOW INFORMATION:
----------------------------------------------------------------------------
   CRITICAL FLOW TOP-WIDTH(FEET) =       19.56
   CRITICAL FLOW AREA(SQUARE FEET) =        18.93
   CRITICAL FLOW HYDRAULIC DEPTH(FEET) =     0.97
   CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) =    5.58
   CRITICAL DEPTH(FEET) =     1.76
   CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) =        1899.30
   AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) =     0.484
   CRITICAL FLOW SPECIFIC ENERGY(FEET) =     2.240
============================================================================
```

SNIPES-DYE ASSOCIATES
Civil Engineers & Land Surveyors
8348 Center Drive Ste. G
LA MESA, CALIFORNIA 91942-2910
(619) 697-9234 FAX (619) 460-2033

JOB SPIRIT OF JOY
SHEET NO. 5 OF
CALCULATED BY WAS DATE 6/24/09
CHECKED BY DATE
SCALE 1" = 4' REV. 9/5/12

NODE 11 (OFF-SITE NATURAL CHANNEL)



V = 4.01 FPS (NON-EROSIVE)

Summary – Retention Facility Calculations

Node	Storm (yr.)	Q (cfs)	Volume (cf)	Q outflow (cfs)	Q Diff. (cfs)
23	10	1.85	775	0.50	-1.35
23	100	2.96	1245	0.50	-2.46
24	10	1.17	699	0.59	-0.58
24	100	1.89	1133	0.59	-1.30
30	10	1.39	837	0.52	-0.87
30	100	2.26	1356	0.52	-1.74
27	10	1.46	612	0.58	-0.88
27	100	2.34	983	0.58	-1.76
33/36	10	2.64	1461	1.70	-0.94
33/36	100	4.27	2365	1.70	-2.57
Total	**10**				**-4.62**
	100				**-9.83**

The above table represents the volume of storage that each of the 6 basins shall retain for each storm indicated along with the total summary of all combined. The basins shall store the runoff to a depth no greater than 1-foot in the parking lots or lawn areas. The metering device shall be 3" outlet pipes. Overflow drains shall be constructed in the landscape planters within the parking lots to prevent ponding at a deeper depth. The details of the overflow drains are not shown on the conceptual grading plan as it is more detail than needed at this level.

For calculation purposes the Q for outflow for the 100 year storm was also utilized for the 10 year storm. This will provide a more conservative approach and the difference was only a few hundredths of a cfs.

In the 10-year storm the difference between the pre and post-development volumes is an increase of 1.0 cfs without any retention. As indicated above 4.62 cfs is being retained, which is adequate to mitigate the development of the site in the 10-year storm.

In the 100-year storm the difference between the pre and post development volumes is an increase of less than 1.0 cfs without any retention. As indicated above 9.83 cfs is being retained, which is adequate to mitigate the development of the site in the 100-year storm.

The following are the calculations for each Node/Basin for the 10-year and 100-year storms. A sketch also follows showing a typical system for catch basin, piping and overflow drain if necessary.

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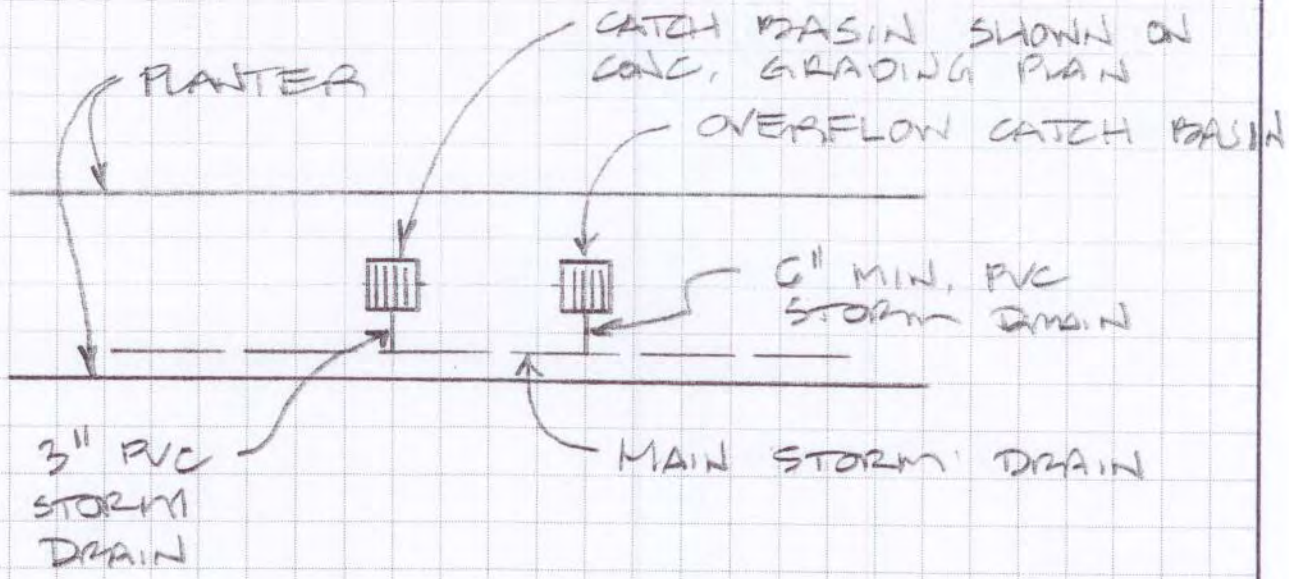
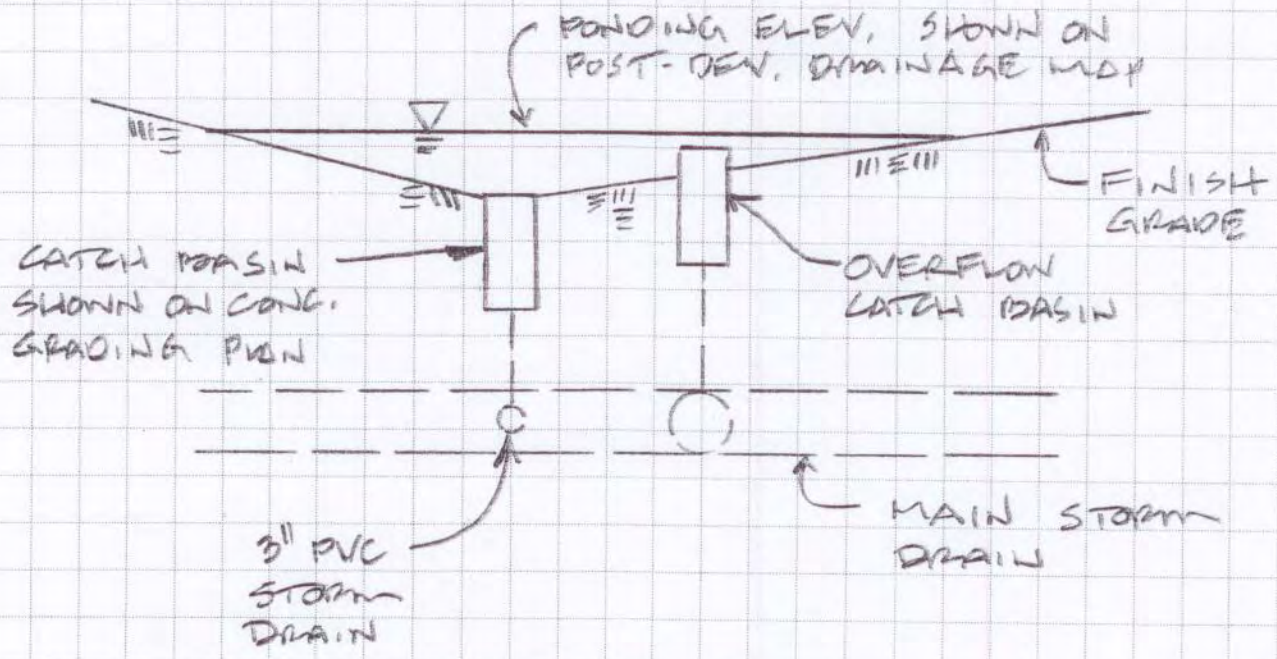
JOB SPIRIT OF JOY BA0272
SHEET NO. 1 OF 1
CALCULATED BY WAS DATE
CHECKED BY DATE
SCALE NONE



PLAN VIEW



SECTION VIEW

TYPICAL SECTION - RETENTION

PRODUCT 204-1 (Single Sheets) 205-1 (Padded)

Hydrograph Plot

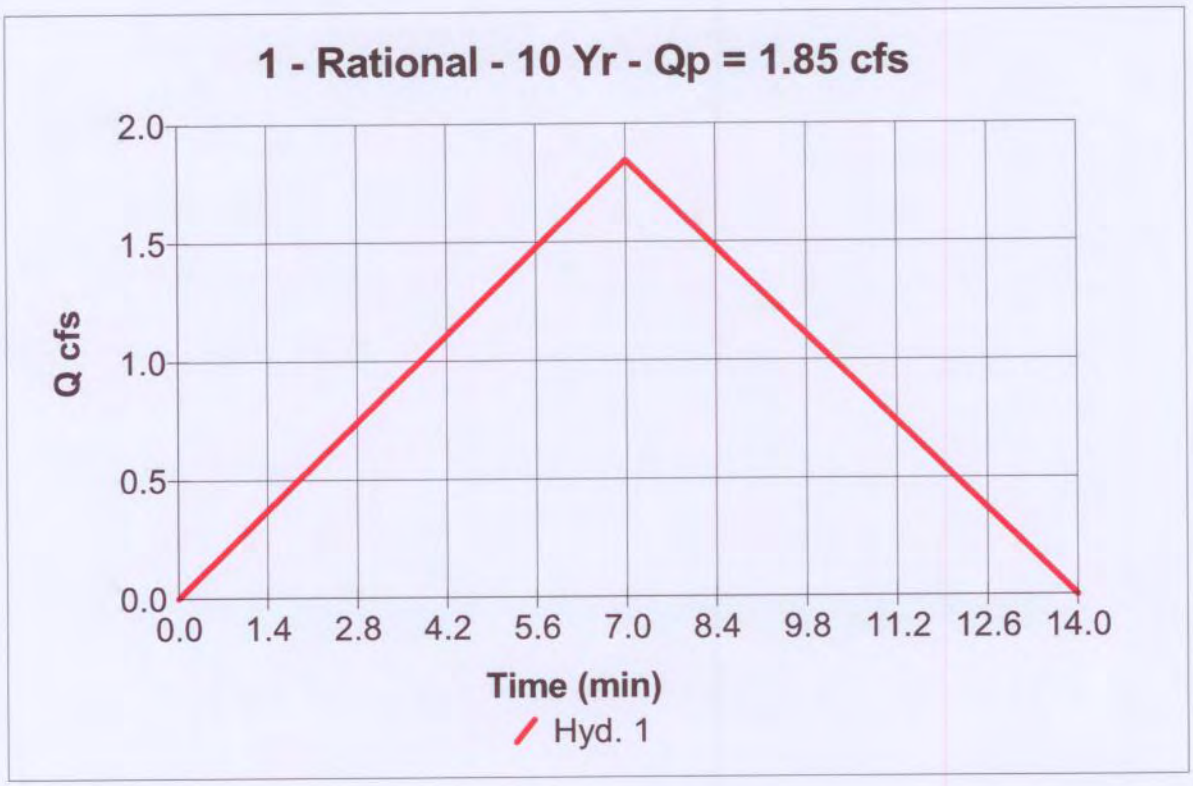
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Node 23 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.85 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 0.6 ac	Runoff coeff.	= 0.63
Intensity	= 4.802 in/hr	Time of conc. (Tc)	= 7 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 775 cuft



Hydrograph Plot

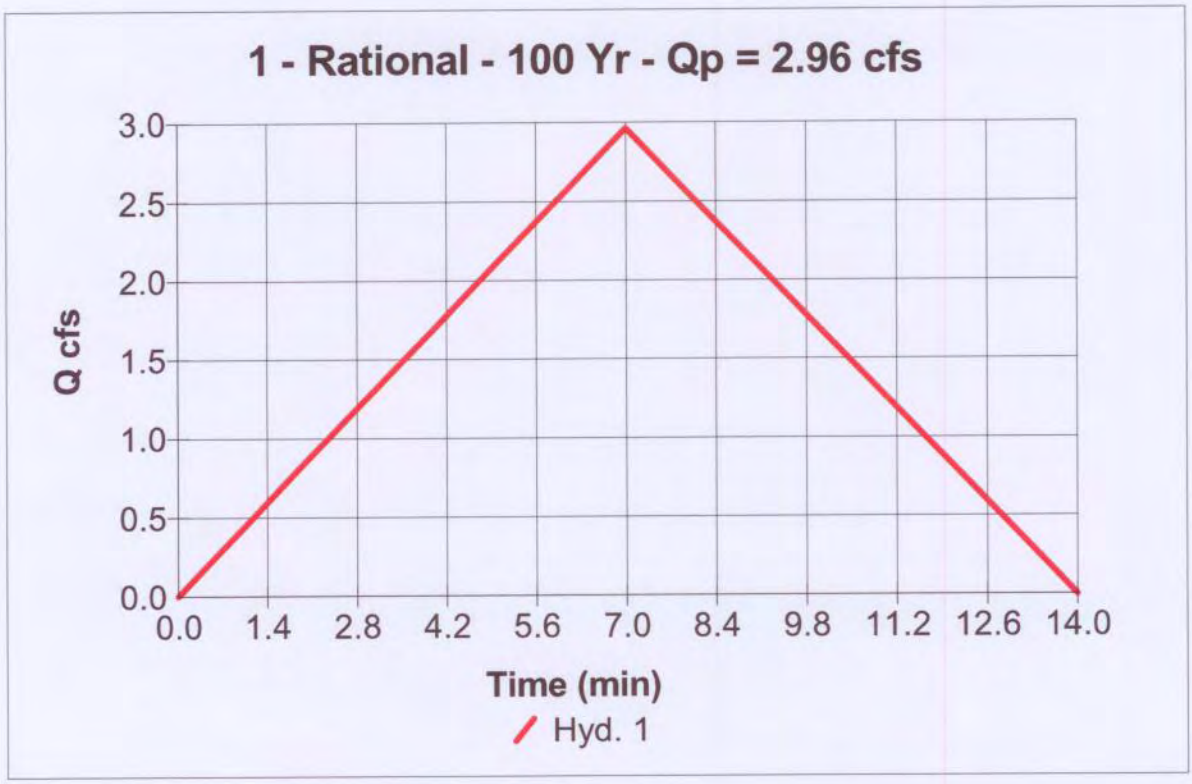
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Node 23 Post Development

Hydrograph type	= Rational	Peak discharge	= 2.96 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.6 ac	Runoff coeff.	= 0.63
Intensity	= 7.711 in/hr	Time of conc. (Tc)	= 7 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 1,245 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - Node 23 Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1415.90	04	0	0
1.00	1416.90	04	4	4
2.00	1417.90	04	4	8
3.00	1418.90	04	4	12
3.10	1419.00	65	3	15
4.00	1419.90	6,500	2,954	2,970
4.10	1420.00	7,810	715	3,685

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 3.0	0.0	0.0	0.0
Span in	= 3.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 1415.90	0.00	0.00	0.00
Length ft	= 5.0	0.0	0.0	0.0
Slope %	= 2.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.80	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

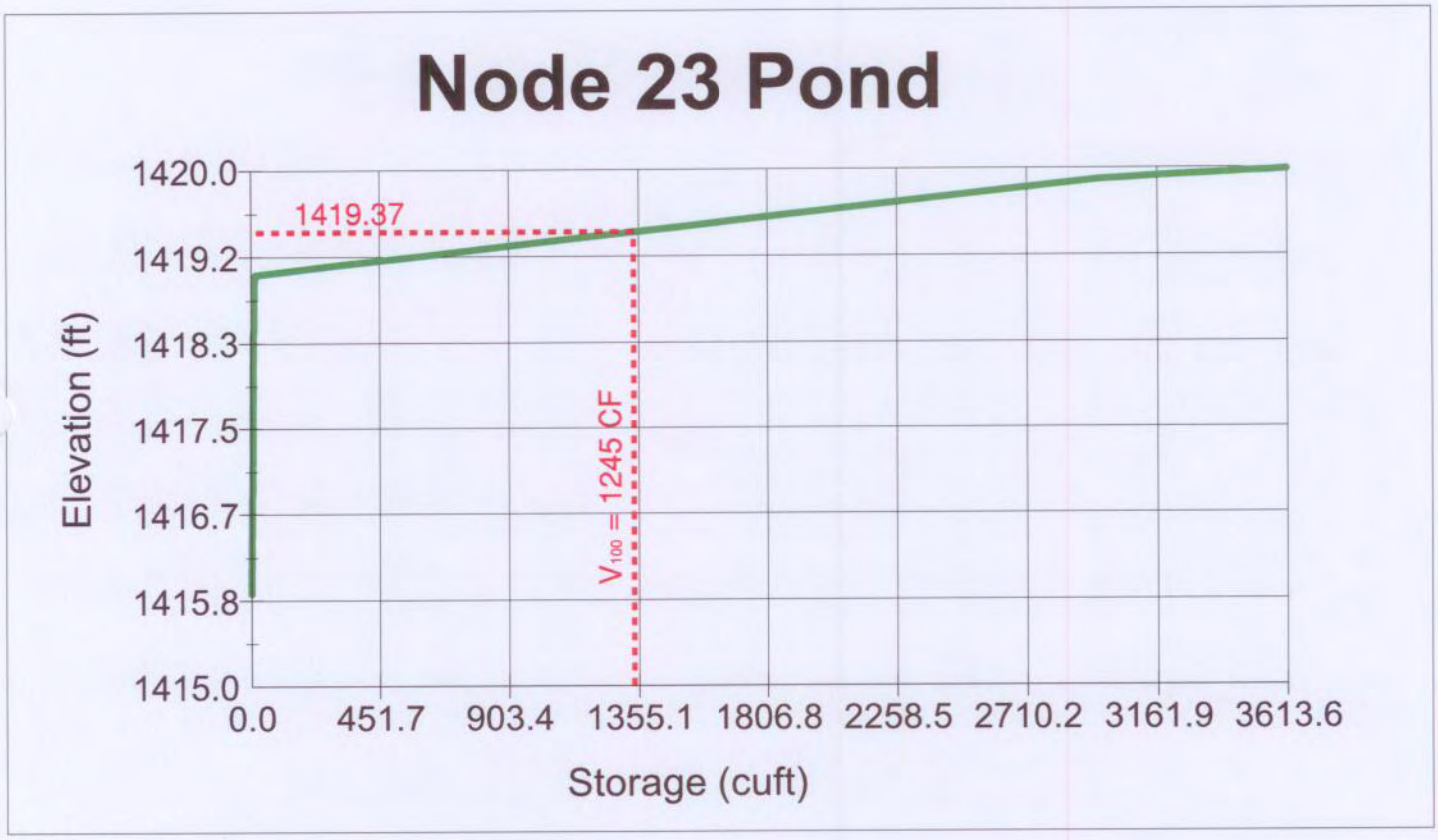
	[A]	[B]	[C]	[D]
Crest Len ft	= 6.00	0.00	0.00	0.00
Crest El. ft	= 1419.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= No	No	No	No

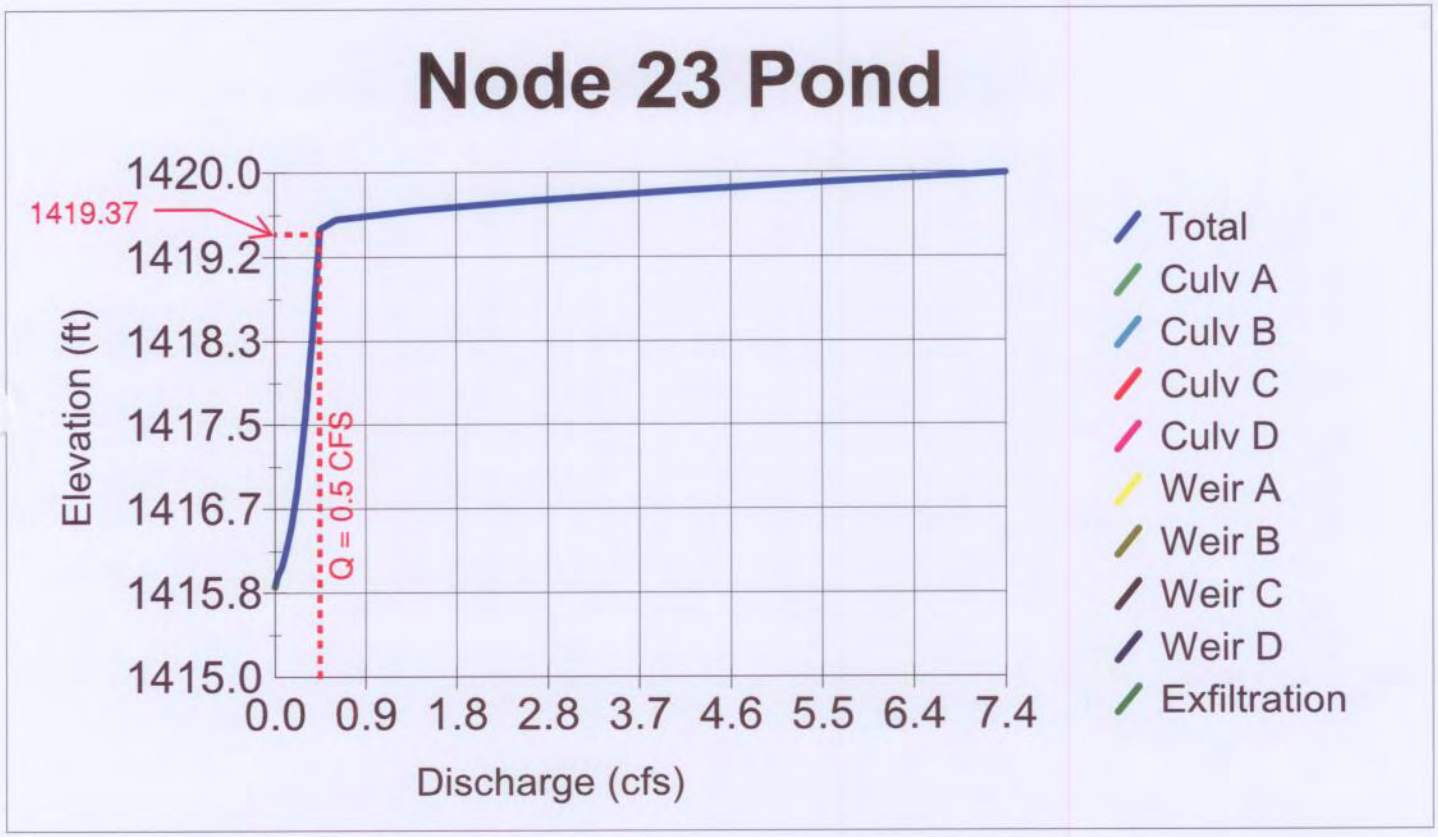
Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	1415.90	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	4	1416.90	0.23	---	---	---	0.00	---	---	---	---	0.23
2.00	8	1417.90	0.34	---	---	---	0.00	---	---	---	---	0.34
3.00	12	1418.90	0.42	---	---	---	0.00	---	---	---	---	0.42
3.10	15	1419.00	0.43	---	---	---	0.00	---	---	---	---	0.43
4.00	2,970	1419.90	0.49	---	---	---	5.06	---	---	---	---	5.55
4.10	3,685	1420.00	0.50	---	---	---	7.06	---	---	---	---	7.56


Node 23 Pond
1420.0
1419.2
1418.3
1417.5
1416.7
1415.8
1415.0
Elevation (ft)
1419.37
V100 = 1245 CF
0.0
451.7
903.4
1355.1
1806.8
2258.5
2710.2
3161.9
3613.6
Storage (cuft)


Node 23 Pond
1420.0
1419.37
1419.2
1418.3
1417.5
1416.7
1415.8
1415.0
Elevation (ft)
Q = 0.5 CFS
0.0 0.9 1.8 2.8 3.7 4.6 5.5 6.4 7.4
Discharge (cfs)
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D
Exfiltration

Hydrograph Plot

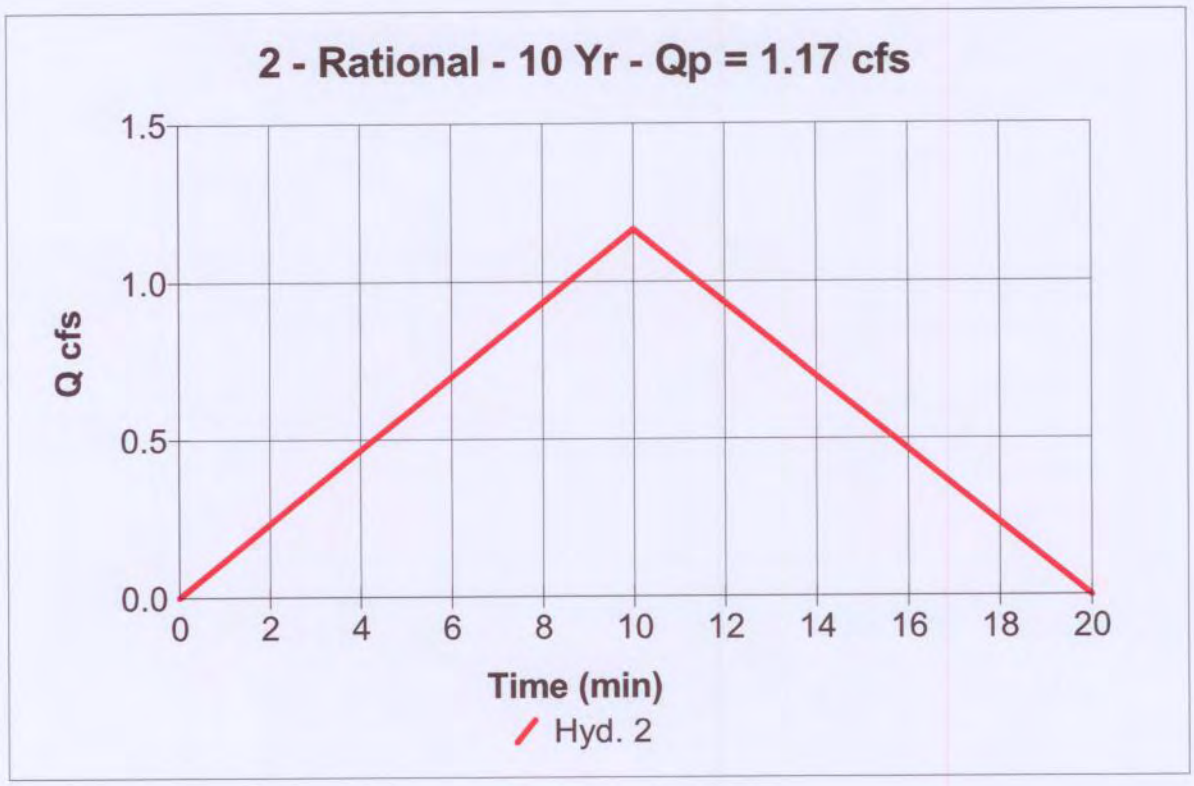
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Node 24 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.17 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 0.6 ac	Runoff coeff.	= 0.5
Intensity	= 3.820 in/hr	Time of conc. (Tc)	= 10 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 699 cuft



Hydrograph Plot

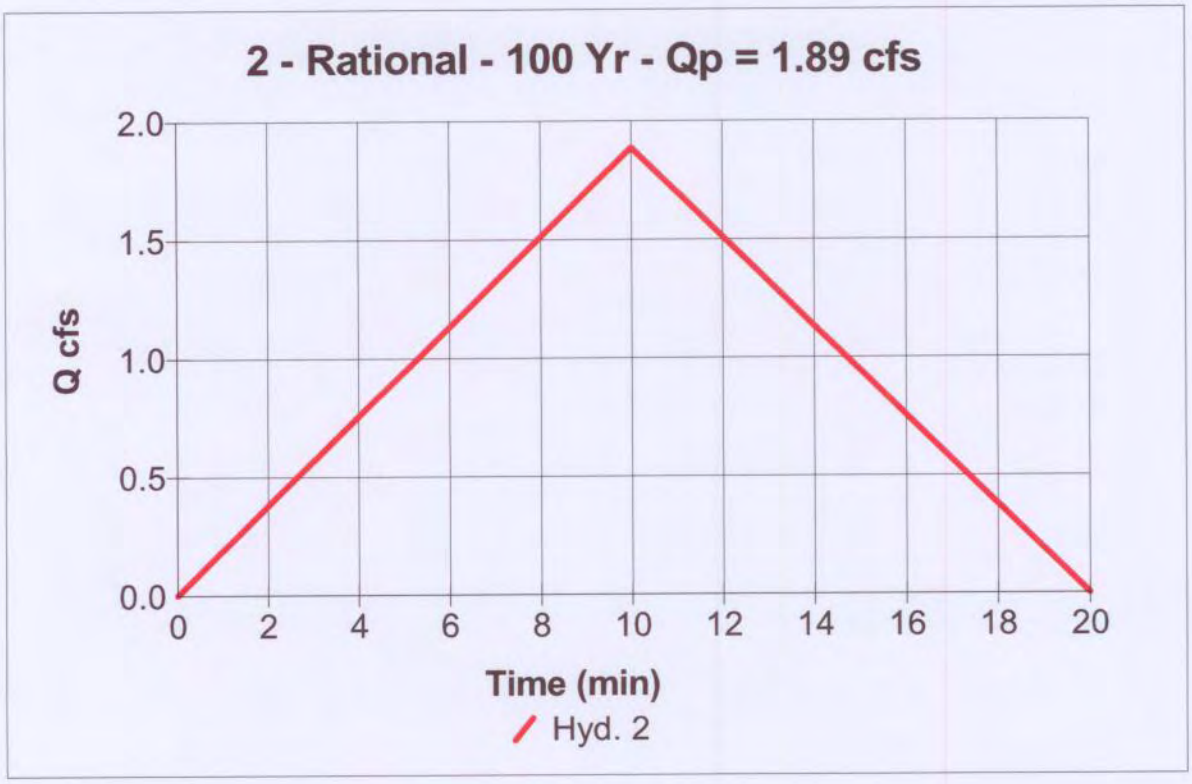
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Node 24 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.89 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.6 ac	Runoff coeff.	= 0.5
Intensity	= 6.192 in/hr	Time of conc. (Tc)	= 10 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 1,133 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - Node 24 Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1414.45	04	0	0
1.00	1415.45	04	4	4
2.00	1416.45	04	4	8
3.00	1417.45	04	4	12
4.00	1418.45	04	4	16
5.00	1419.45	04	4	20
5.30	1419.75	04	1	21
5.55	1420.00	720	91	112
6.15	1420.60	6,512	2,170	2,281

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 3.0	0.0	0.0	0.0
Span in	= 3.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 1414.45	0.00	0.00	0.00
Length ft	= 5.0	0.0	0.0	0.0
Slope %	= 2.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.80	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

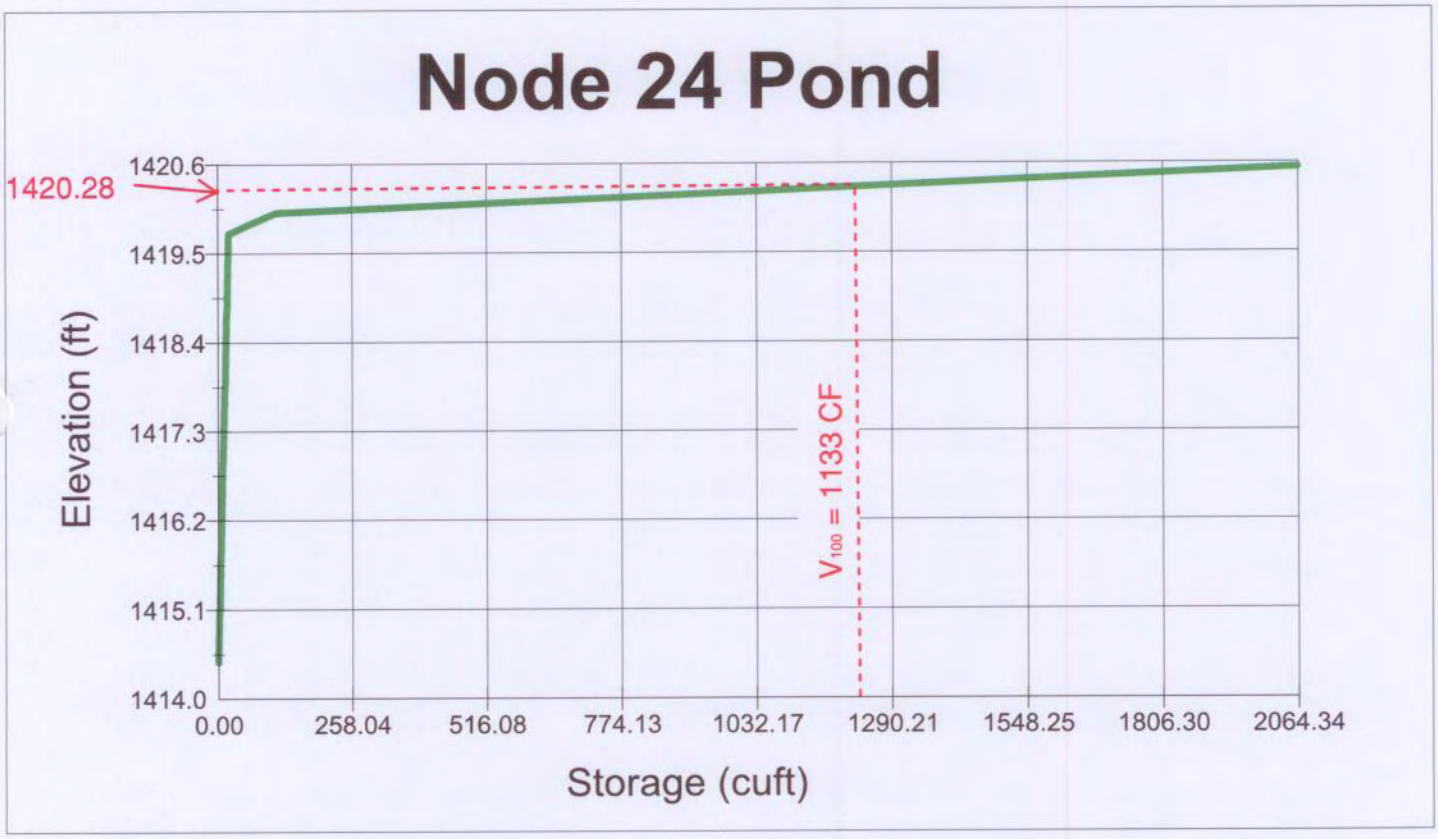
	[A]	[B]	[C]	[D]
Crest Len ft	= 24.00	0.00	0.00	0.00
Crest El. ft	= 1420.60	0.00	0.00	0.00
Weir Coeff.	= 2.60	0.00	0.00	0.00
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

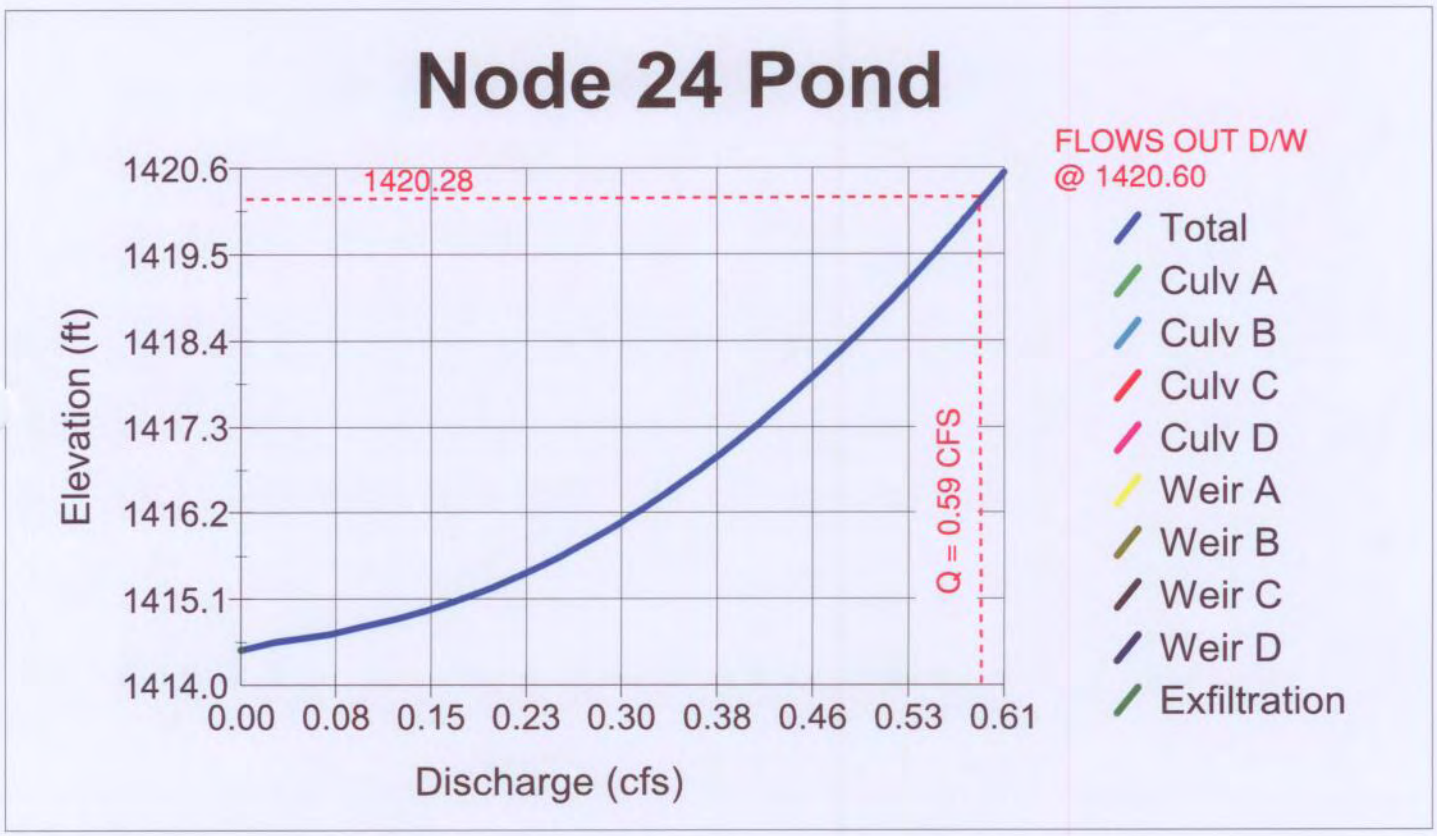
Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	1414.45	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	4	1415.45	0.23	---	---	---	0.00	---	---	---	---	0.23
2.00	8	1416.45	0.34	---	---	---	0.00	---	---	---	---	0.34
3.00	12	1417.45	0.42	---	---	---	0.00	---	---	---	---	0.42
4.00	16	1418.45	0.49	---	---	---	0.00	---	---	---	---	0.49
5.00	20	1419.45	0.55	---	---	---	0.00	---	---	---	---	0.55
5.30	21	1419.75	0.57	---	---	---	0.00	---	---	---	---	0.57
5.55	112	1420.00	0.58	---	---	---	0.00	---	---	---	---	0.58
6.15	2,281	1420.60	0.61	---	---	---	0.00	---	---	---	---	0.61


Node 24 Pond
1420.28
1420.6
1419.5
1418.4
1417.3
1416.2
1415.1
1414.0
Elevation (ft)
V_{100} = 1133 CF
0.00
258.04
516.08
774.13
1032.17
1290.21
1548.25
1806.30
2064.34
Storage (cuft)


Node 24 Pond
FLOWS OUT D/W
@ 1420.60
1420.28
Q = 0.59 CFS
1420.6
1419.5
1418.4
1417.3
1416.2
1415.1
1414.0
Elevation (ft)
0.00
0.08
0.15
0.23
0.30
0.38
0.46
0.53
0.61
Discharge (cfs)
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D
Exfiltration

Hydrograph Plot

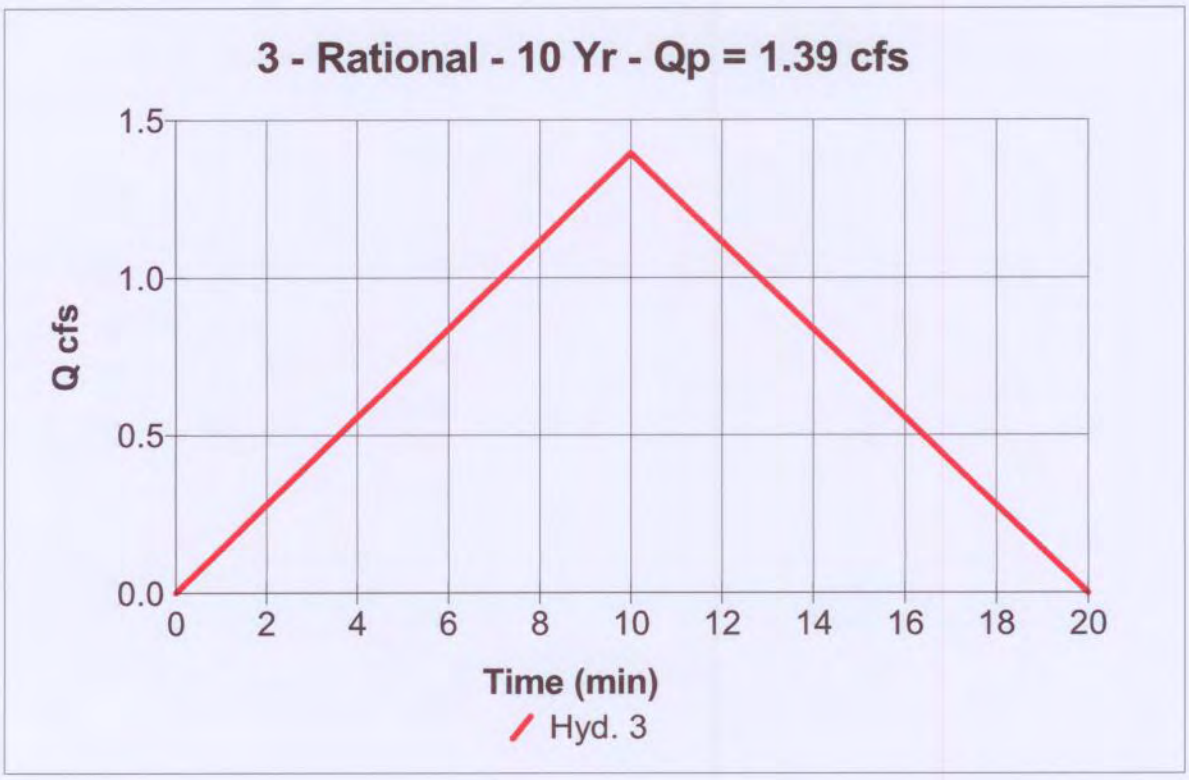
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

Node 30 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.39 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 0.7 ac	Runoff coeff.	= 0.5
Intensity	= 3.820 in/hr	Time of conc. (Tc)	= 10 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 837 cuft



Hydrograph Plot

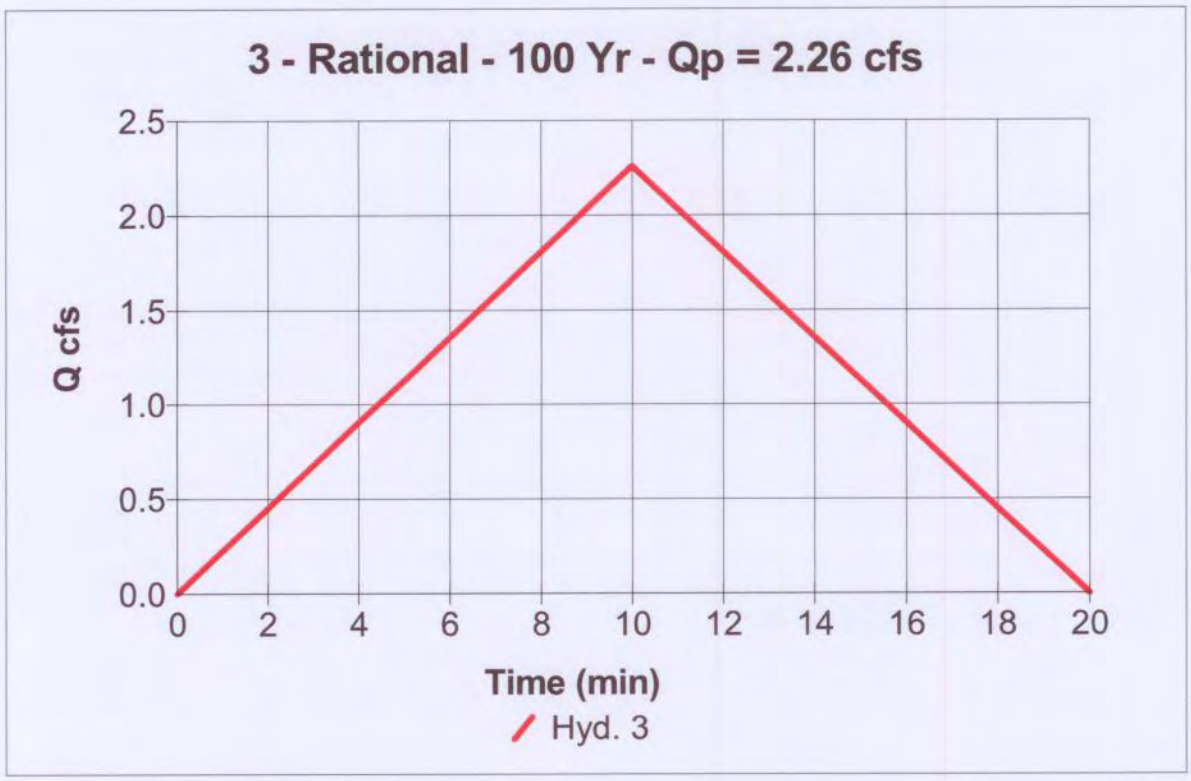
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

Node 30 Post Development

Hydrograph type	= Rational	Peak discharge	= 2.26 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.7 ac	Runoff coeff.	= 0.5
Intensity	= 6.192 in/hr	Time of conc. (Tc)	= 10 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 1,356 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - Node 30 Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1415.75	04	0	0
1.00	1416.75	04	4	4
2.00	1417.75	04	4	8
3.00	1418.75	04	4	12
4.00	1419.75	04	4	16
4.25	1420.00	720	91	107
4.85	1420.60	6,512	2,170	2,276

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 3.0	0.0	0.0	0.0
Span in	= 3.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 1415.75	0.00	0.00	0.00
Length ft	= 5.0	0.0	0.0	0.0
Slope %	= 2.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.80	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 24.00	0.00	0.00	0.00
Crest El. ft	= 1420.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	0.00	0.00	0.00
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

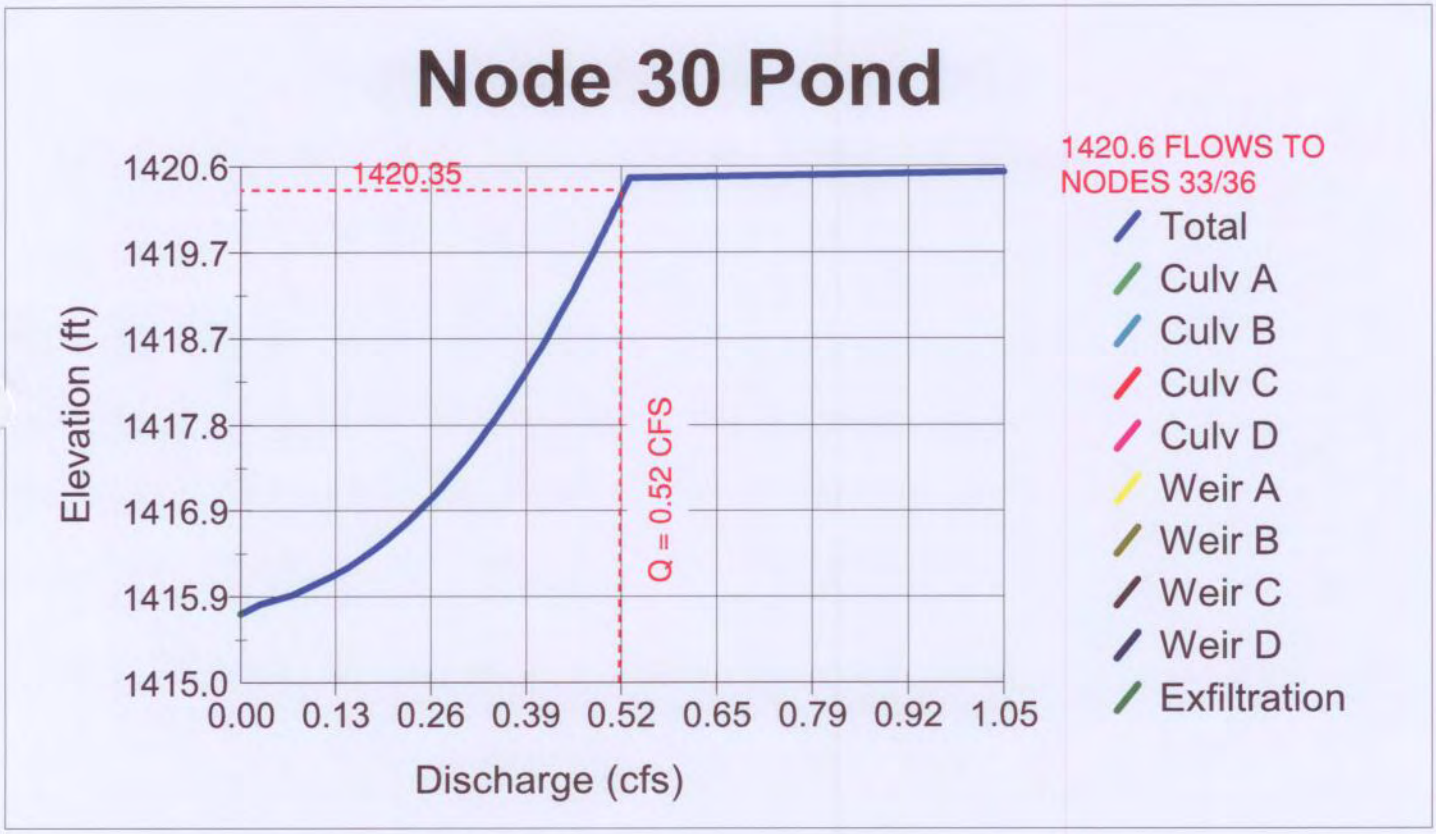
Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	1415.75	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	4	1416.75	0.23	---	---	---	0.00	---	---	---	---	0.23
2.00	8	1417.75	0.34	---	---	---	0.00	---	---	---	---	0.34
3.00	12	1418.75	0.42	---	---	---	0.00	---	---	---	---	0.42
4.00	16	1419.75	0.49	---	---	---	0.00	---	---	---	---	0.49
4.25	107	1420.00	0.51	---	---	---	0.00	---	---	---	---	0.51
4.85	2,276	1420.60	0.54	---	---	---	1.97	---	---	---	---	2.51

Node 30 Pond

1420.35
1420.6
1419.7
1418.7
1417.8
1416.9
1415.9
1415.0
Elevation (ft)
0.0
257.4
514.8
772.2
1029.6
1287.0
1544.4
1801.7
2059.1
Storage (cuft)
Q100 = 1356 cf


Node 30 Pond
1420.6
1419.7
1418.7
1417.8
1416.9
1415.9
1415.0
Elevation (ft)
1420.35
Q = 0.52 CFS
0.00
0.13
0.26
0.39
0.52
0.65
0.79
0.92
1.05
Discharge (cfs)
1420.6 FLOWS TO NODES 33/36
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D
Exfiltration

Hydrograph Plot

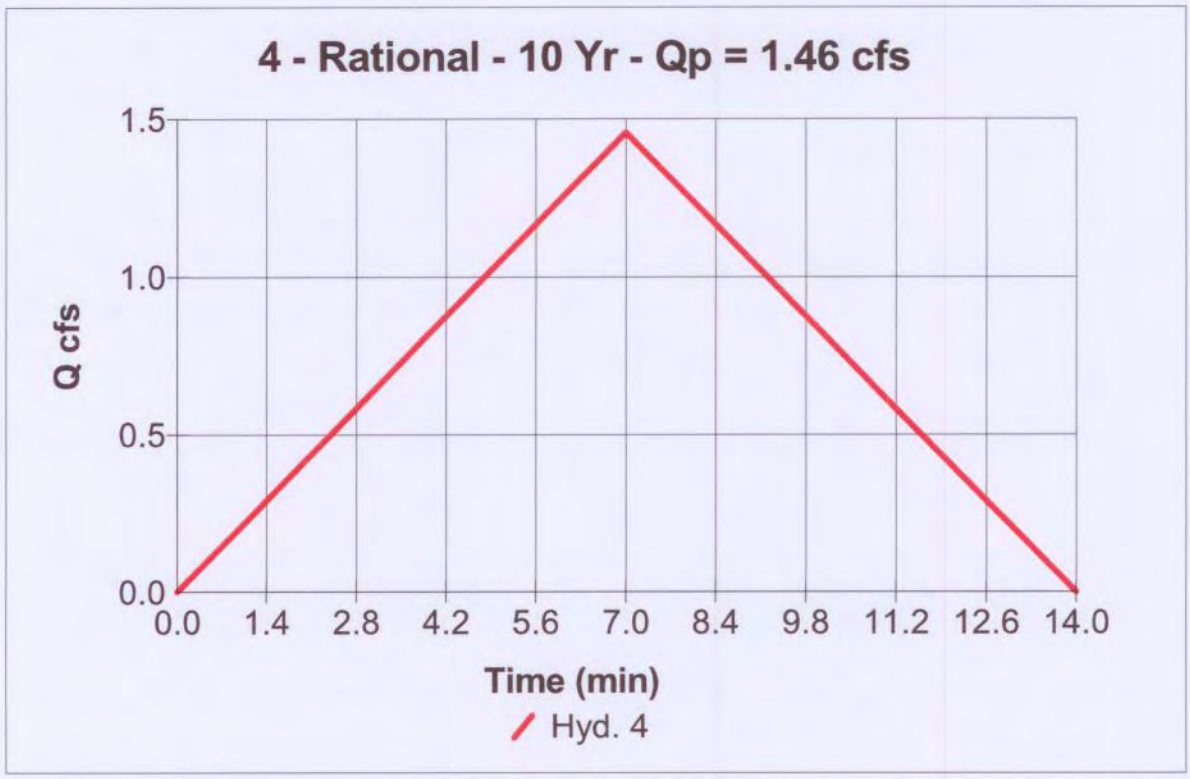
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

Node 27 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.46 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 0.7 ac	Runoff coeff.	= 0.44
Intensity	= 4.802 in/hr	Time of conc. (Tc)	= 7 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 612 cuft



Hydrograph Plot

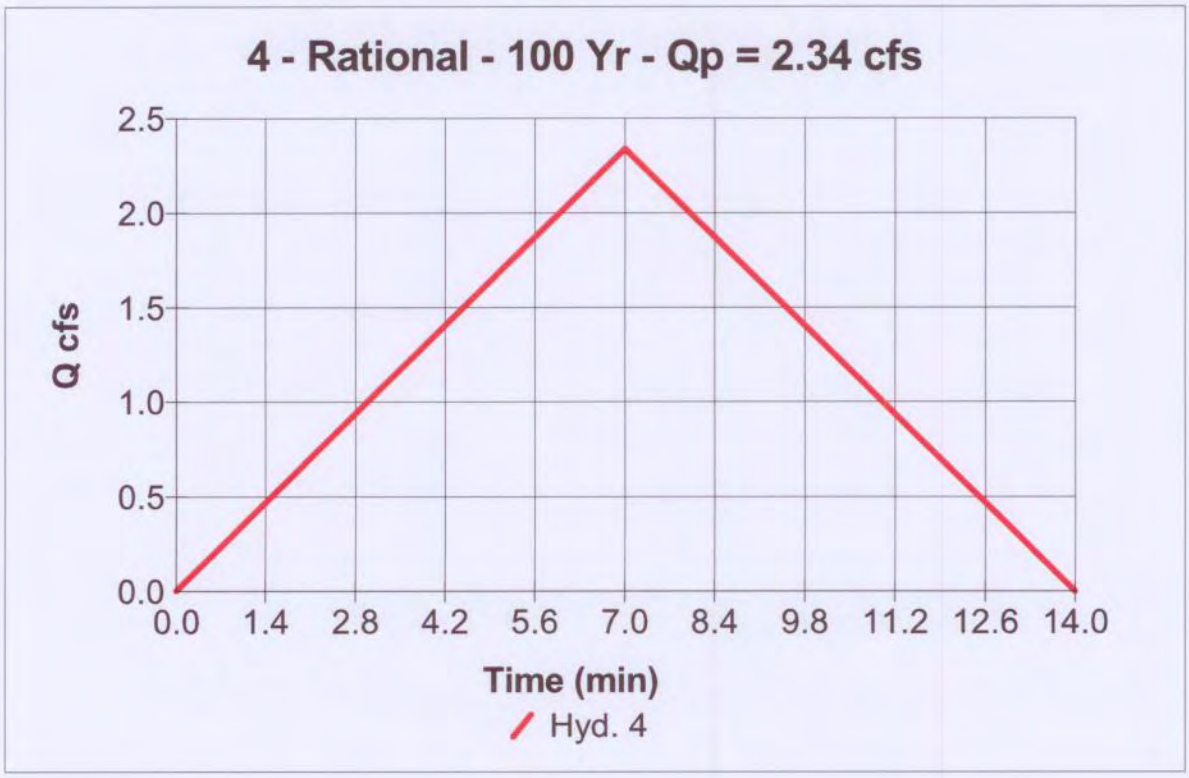
Hydraflow Hydrographs by Intelisolve

Hyd. No. 4

Node 27 Post Development

Hydrograph type	= Rational	Peak discharge	= 2.34 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.7 ac	Runoff coeff.	= 0.44
Intensity	= 7.711 in/hr	Time of conc. (Tc)	= 7 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 983 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 4 - Node 27 Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1413.85	04	0	0
1.00	1414.85	04	4	4
2.00	1415.85	04	4	8
3.00	1416.85	04	4	12
4.00	1417.85	04	4	16
5.00	1418.85	04	4	20
5.05	1418.90	04	0	20
5.15	1419.00	560	28	48
5.75	1419.60	6,304	2,059	2,108

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 3.0	0.0	0.0	0.0
Span in	= 3.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 1413.85	0.00	0.00	0.00
Length ft	= 5.0	0.0	0.0	0.0
Slope %	= 2.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.80	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

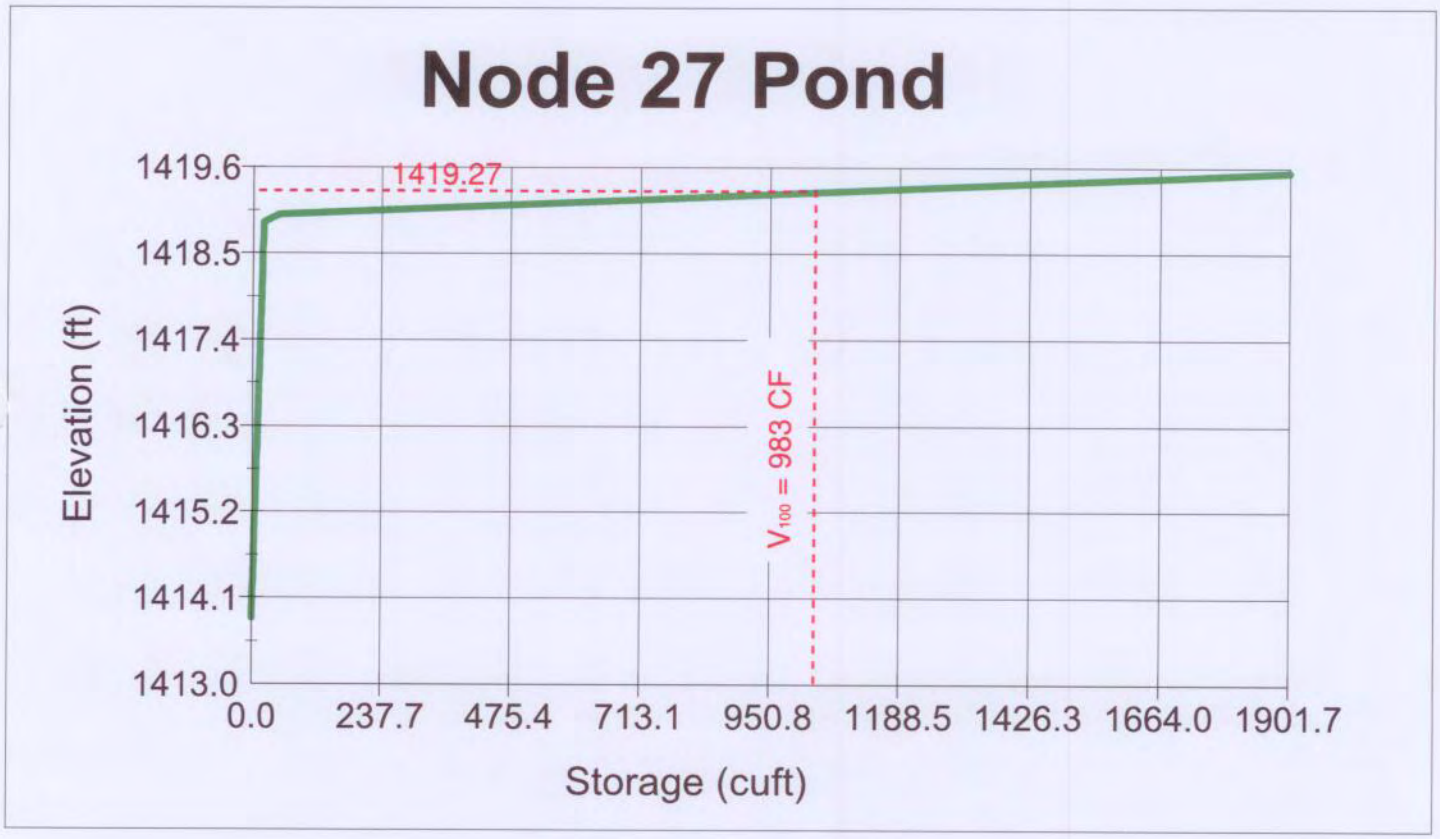
	[A]	[B]	[C]	[D]
Crest Len ft	= 20.00	0.00	0.00	0.00
Crest El. ft	= 1419.55	0.00	0.00	0.00
Weir Coeff.	= 2.60	0.00	0.00	0.00
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

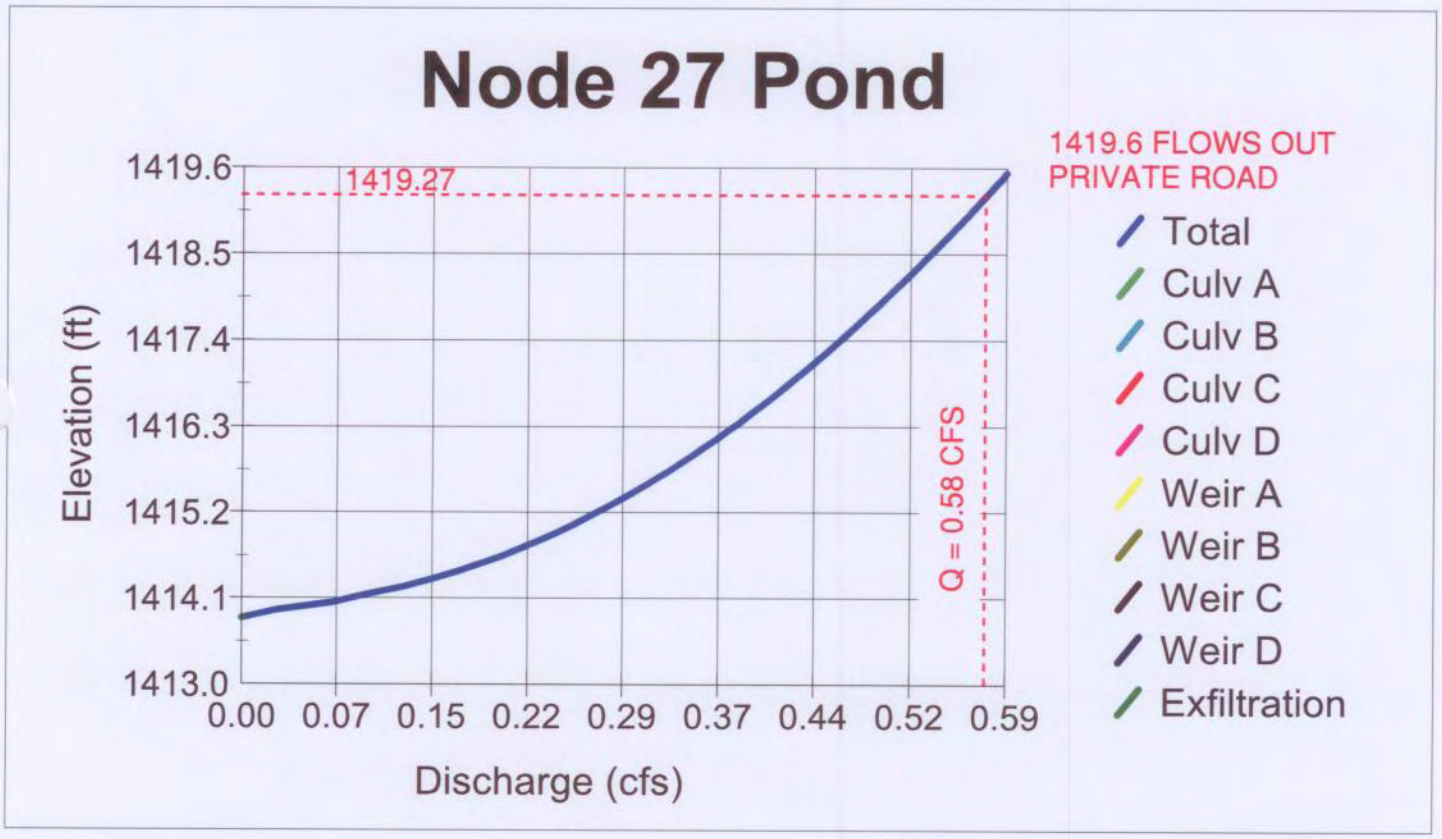
Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	1413.85	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	4	1414.85	0.23	---	---	---	0.00	---	---	---	---	0.23
2.00	8	1415.85	0.34	---	---	---	0.00	---	---	---	---	0.34
3.00	12	1416.85	0.42	---	---	---	0.00	---	---	---	---	0.42
4.00	16	1417.85	0.49	---	---	---	0.00	---	---	---	---	0.49
5.00	20	1418.85	0.55	---	---	---	0.00	---	---	---	---	0.55
5.05	20	1418.90	0.55	---	---	---	0.00	---	---	---	---	0.55
5.15	48	1419.00	0.56	---	---	---	0.00	---	---	---	---	0.56
5.75	2,108	1419.60	0.59	---	---	---	0.58	---	---	---	---	1.17


Node 27 Pond
1419.6
1418.5
1417.4
1416.3
1415.2
1414.1
1413.0
Elevation (ft)
1419.27
V100 = 983 CF
0.0
237.7
475.4
713.1
950.8
1188.5
1426.3
1664.0
1901.7
Storage (cuft)


Node 27 Pond
1419.6 FLOWS OUT PRIVATE ROAD
1419.27
Q = 0.58 CFS
Elevation (ft)
1419.6
1418.5
1417.4
1416.3
1415.2
1414.1
1413.0
0.00
0.07
0.15
0.22
0.29
0.37
0.44
0.52
0.59
Discharge (cfs)
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D
Exfiltration

Hydrograph Plot

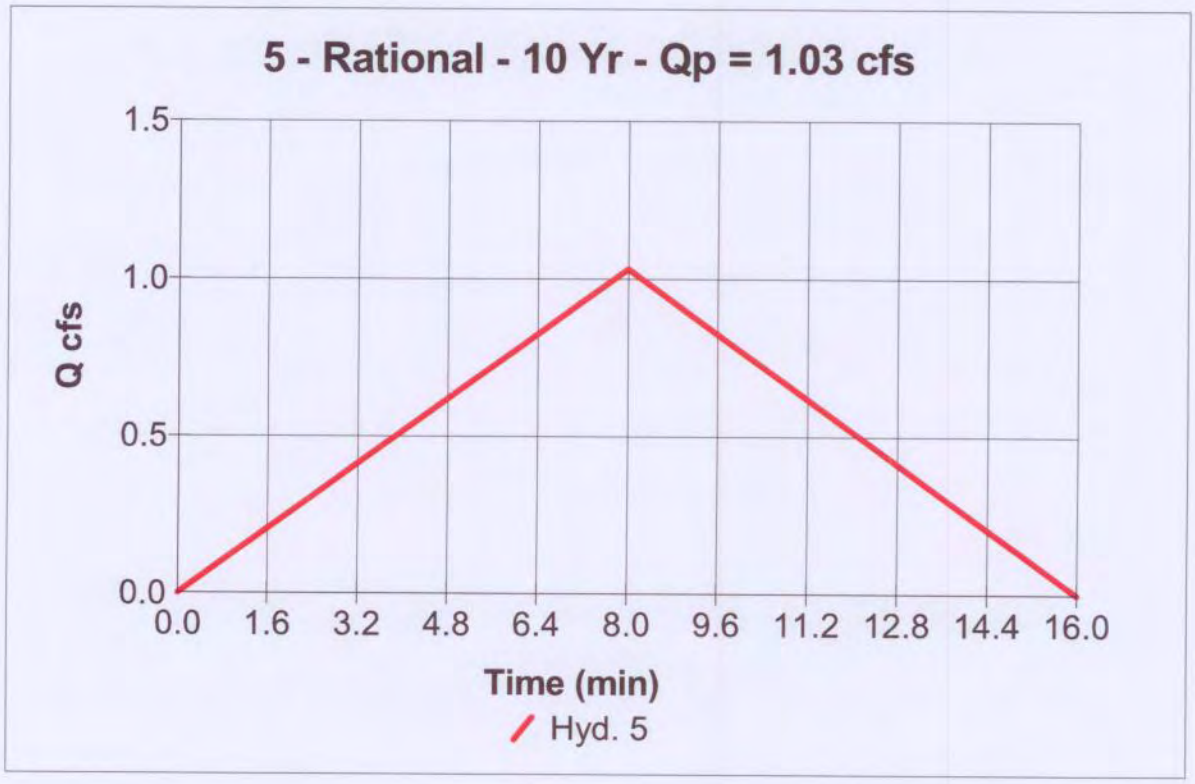
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

Node 33 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.03 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 0.4 ac	Runoff coeff.	= 0.6
Intensity	= 4.408 in/hr	Time of conc. (Tc)	= 8 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 495 cuft



Hydrograph Plot

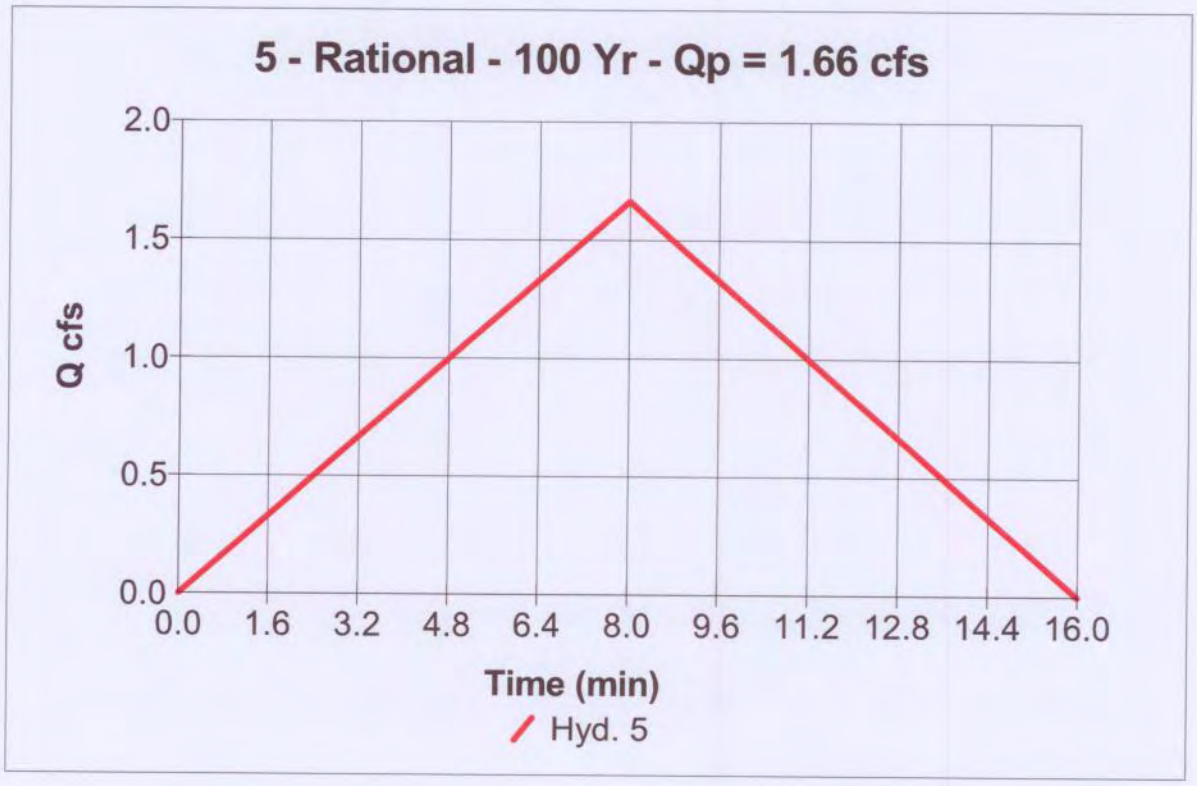
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

Node 33 Post Development

Hydrograph type	= Rational	Peak discharge	= 1.66 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 0.4 ac	Runoff coeff.	= 0.6
Intensity	= 7.112 in/hr	Time of conc. (Tc)	= 8 min
IDF Curve	= Spirit of Joy Retention.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 799 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 5 - Nodes 33/36 Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1412.85	04	0	0
0.35	1413.20	08	2	2
1.00	1413.85	08	5	7
2.00	1414.85	08	8	15
3.00	1415.85	08	8	23
4.00	1416.85	08	8	31
4.45	1417.30	08	4	35
4.55	1417.40	08	1	36
5.15	1418.00	1,872	564	600
5.55	1418.40	10,672	2,509	3,109

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 3.0	3.0	0.0	0.0
Span in	= 3.0	3.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 1412.85	1413.20	0.00	0.00
Length ft	= 5.0	5.0	0.0	0.0
Slope %	= 2.00	2.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.80	0.80	0.00	0.00
Multi-Stage	= n/a	No	No	No

Weir Structures

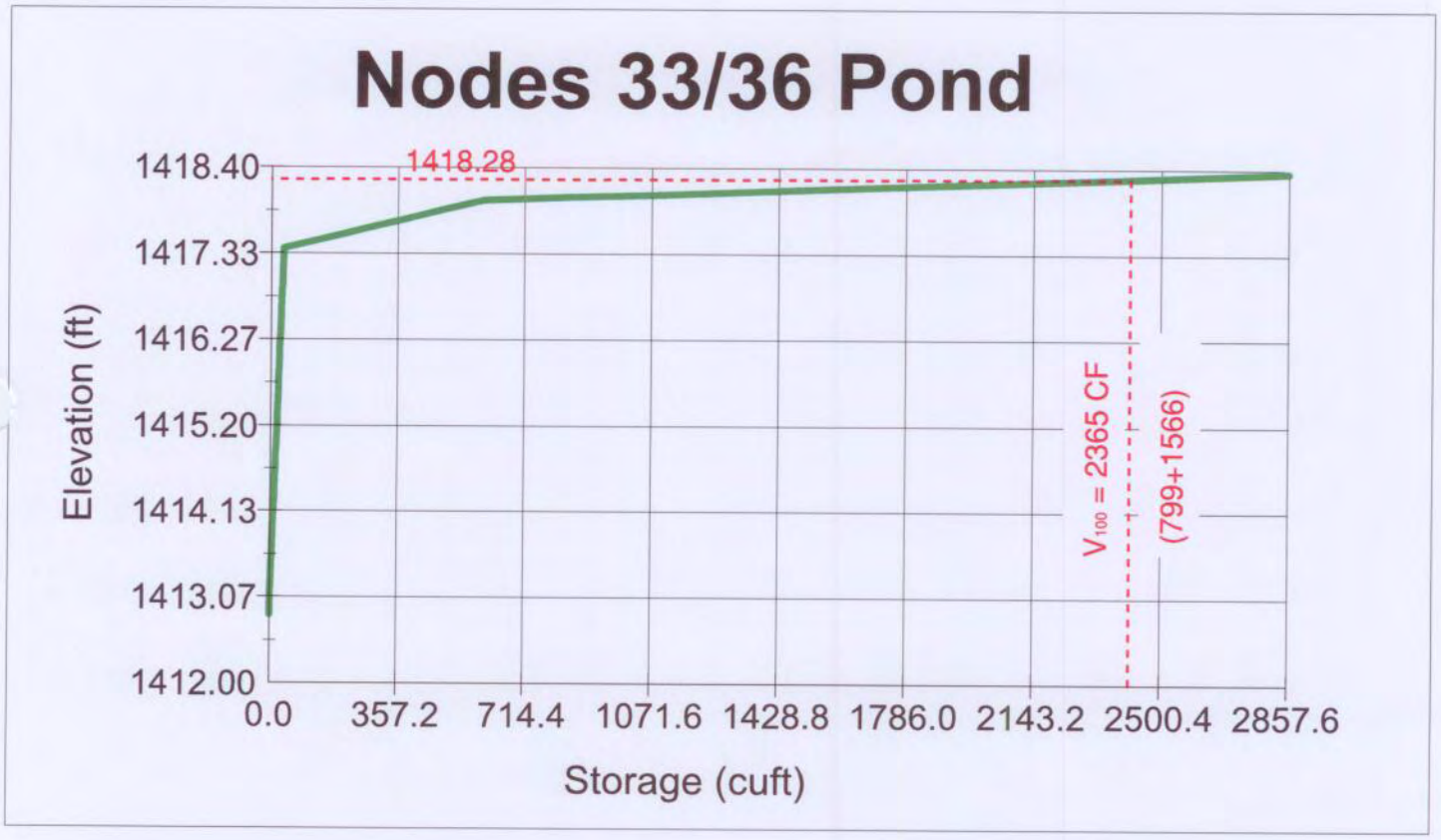
	[A]	[B]	[C]	[D]
Crest Len ft	= 10.00	0.00	0.00	0.00
Crest El. ft	= 1418.20	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= No	No	No	No

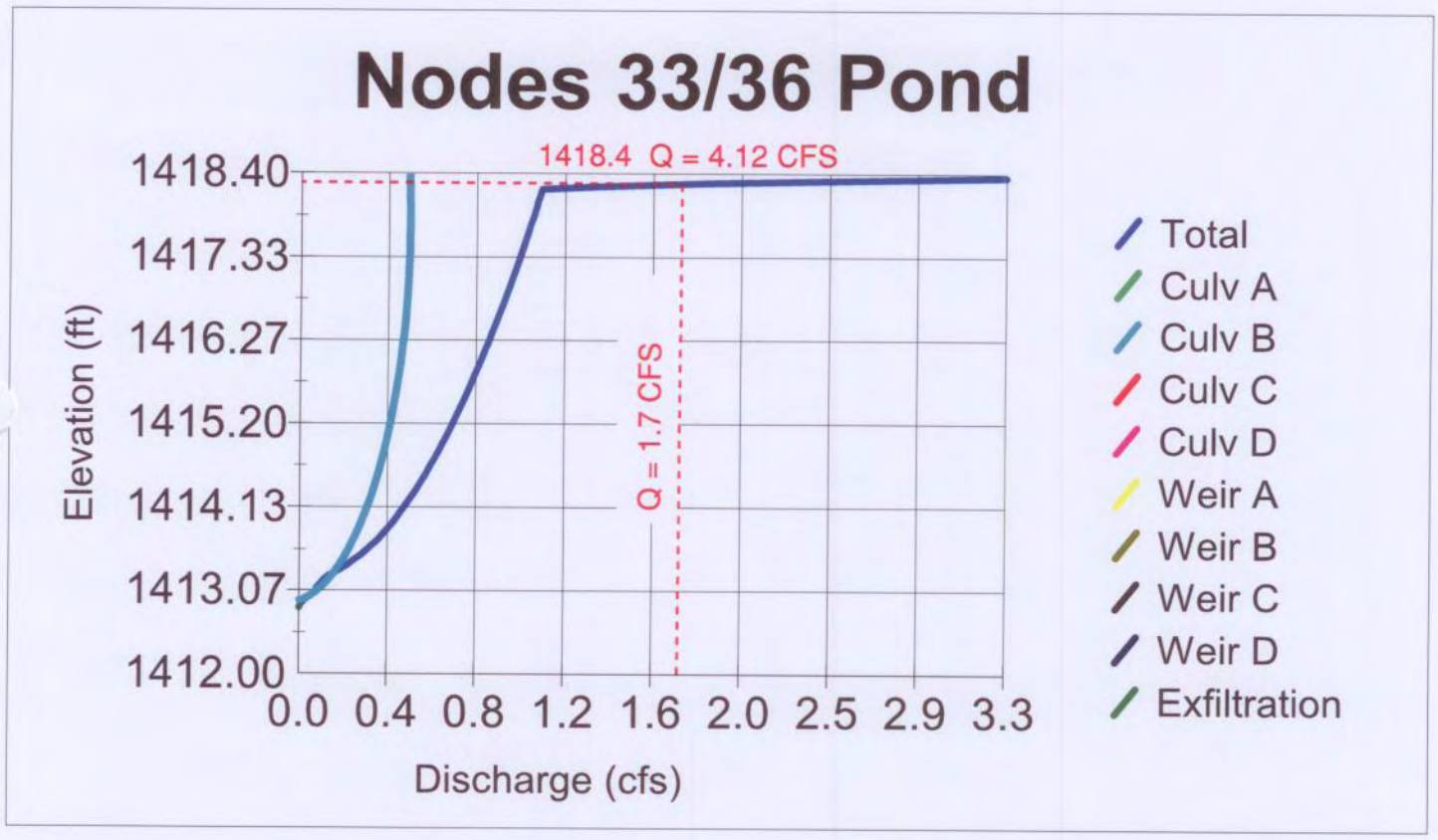
Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	1412.85	0.00	0.00	---	---	0.00	---	---	---	---	0.00
0.35	2	1413.20	0.11	0.00	---	---	0.00	---	---	---	---	0.11
1.00	7	1413.85	0.23	0.18	---	---	0.00	---	---	---	---	0.41
2.00	15	1414.85	0.34	0.31	---	---	0.00	---	---	---	---	0.65
3.00	23	1415.85	0.42	0.40	---	---	0.00	---	---	---	---	0.82
4.00	31	1416.85	0.49	0.47	---	---	0.00	---	---	---	---	0.96
4.45	35	1417.30	0.52	0.50	---	---	0.00	---	---	---	---	1.02
4.55	36	1417.40	0.52	0.50	---	---	0.00	---	---	---	---	1.03
5.15	600	1418.00	0.56	0.54	---	---	0.00	---	---	---	---	1.10
5.55	3,109	1418.40	0.58	0.56	---	---	2.98	---	---	---	---	4.12


Nodes 33/36 Pond
1418.28
1418.40
1417.33
1416.27
1415.20
1414.13
1413.07
1412.00
Elevation (ft)
0.0
357.2
714.4
1071.6
1428.8
1786.0
2143.2
2500.4
2857.6
Storage (cuft)
V100 = 2365 CF
(799+1566)


Nodes 33/36 Pond
1418.4 Q = 4.12 CFS
Q = 1.7 CFS
1418.40
1417.33
1416.27
1415.20
1414.13
1413.07
1412.00
Elevation (ft)
0.0 0.4 0.8 1.2 1.6 2.0 2.5 2.9 3.3
Discharge (cfs)
Total
Culv A
Culv B
Culv C
Culv D
Weir A
Weir B
Weir C
Weir D
Exfiltration