



Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING

HYDROLOGY & HYDRAULIC CALCULATIONS

FOR

HILLWOOD GATEWAY SOUTH BUILDING 8
NORMAN ROAD AND LENA ROAD
CITY OF SAN BERNARDINO, CALIFORNIA

PREPARED FOR

HILLWOOD INVESTMENTS
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MARCH 25, 2022

JOB NO. 3575

PREPARED BY

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**HYDROLOGY & HYDRAULIC
CALCULATIONS**

FOR

HILLWOOD GATEWAY SOUTH BUILDING 8

PREPARED UNDER
THE SUPERVISION OF

REINHARD STENZEL DATE:
R.C.E. 56155
EXP. 12/31/22

INTRODUCTION

A: PROJECT LOCATION

The project site is located at the northwest corner of Norman Road and Lena Road in the City of San Bernardino. Please see next page for vicinity map.

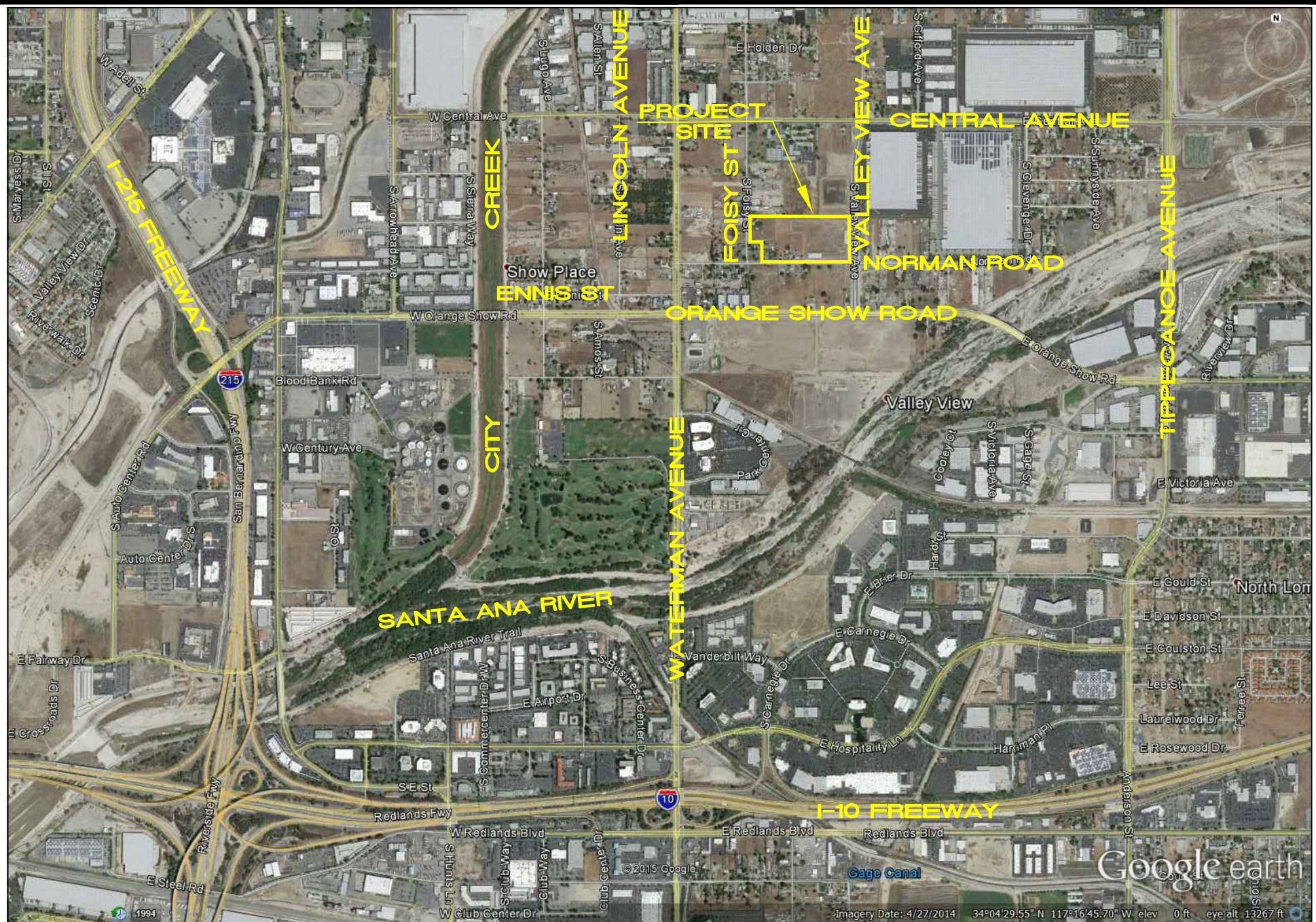
B: STUDY PURPOSE

The purpose of this study is to determine peak flow rates from the project site and analyze the modifications to the existing detention basin.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Brian Weil
James Wickenhaeuser



DISCUSSION

The project site encompasses approximately 15.2 acres. Proposed improvements include one warehouse building with approximately 304,588 square feet. There is a truck yard located on the northerly side of the building. There is vehicle parking on the westerly side of the site and additional parking at the northeasterly portion of the building. A portion of the site is an existing detention basin. This basin will be filled with the northeasterly portion to be redesigned as a detention basin with equivalent volume as the overall existing detention basin.

Master Plan of Drainage Hydrology

The project site is part of a previously approved Master Plan of Drainage. The easterly portion of the project site is an existing detention basin. Currently, there are two existing storm drain systems that discharge into the existing detention basin. The detention basin discharges flow to Norman Road. The remaining westerly portion of the site tends to drain westerly towards Foisy Road. The Master Plan of Drainage tables the site (and discharge from the detention basin) to the proposed storm drain system in Norman Road.

See Appendix “A” for portions of the Master Plan of Drainage and previously approved hydrology and basin routing calculations.

Proposed Condition

The layout of the proposed site will require the relocation of the existing detention basin. The northeasterly portion of the site will be the location of the new detention basin. While the basin footprint is smaller, the proposed basin is deeper and has a similar volume to the existing detention basin. A public storm drain will be designed from the detention basin through the site then to Norman Road. This storm drain continues westerly in Norman Road ultimately connecting to the recently built storm drain system in Waterman Avenue.

Runoff from the westerly parking areas (nodes 100-122) drain to grate inlets located in the parking areas. A proposed storm drain system will convey runoff easterly to the truck yard area. Runoff from the northerly half of the building and the truck yard area (nodes 130-133) drain to grate inlets at the westerly portion of the truck yard. Confluent peak flows (at node 134) are then conveyed to the previously mentioned public storm drain system (at node 135). The 100-year peak flow for this portion of the site is approximately 31.7 cfs.

Runoff from the southerly portion of the proposed building (nodes 200-223) will discharge to Norman Road via 3 proposed parkway culverts. The respective 100-year peak flow rates are 4.0 cfs, 4.0 cfs and 2.8 cfs. Note that there is a low flow storm drain system that conveys the required water quality peak flow rate to the storage chambers located on the northerly portion of the site. once this drain is full, flow from the roof drains can discharge through the culverts.

A portion of Foisy Street (Nodes 300-301) will drain to a sump condition located on the south side of the westerly driveway. A temporary inlet will collect flows and conveyed them to the proposed onsite storm drain system. The peak flow rate to this temporary inlet is approximately 0.7 cfs.

The proposed public storm drain that will be built as part of this development is designed to carry the 100-year flows from the project site westerly down Norman Road towards City Creek and the Santa Ana River. This means there will not be any onsite stormwater detention to mitigate the peak flow rates.

See Appendix "B" for hydrology calculations and Appendix "F" for hydrology map.

Existing Basin Analysis

The existing detention basins were previously analyzed in a report by Thienes Engineering, Inc. (Hydrology and Hydraulic Calculations for Gateway North and Central Avenue Storm Drain, dated December 15, 2005). This study also provided Master Plan of Drainage for areas tributary to the basin. From this report, approximately 242 acres is tributary to the detention area. Note that several upstream areas of the Master Plan of Drainage were not tributary to the existing basin (27.0 acres at node 221, 20.0 acres at node 231 and 18 acres of 26.0 acres at node 341) at the time of the original study.

With the current basin, runoff is discharged to Norman Road in an amount less than the existing condition 100-year peak flow rate at the same location. Discharge from the basin is controlled by several 15" pipes at various elevations in the basin (6 pipes at elevation 1020.70, 6 pipes at elevation 1021.5 and 3 pipes at elevation 1022.5). From the original study, approximately 148.5 cfs discharged from the basin with a depth of 4.70' and a detained volume of about 17.61 acre-feet.

Existing condition rational method calculations for areas tributary to the basin as well as the Rational Method calculations for the entire Master Plan are unchanged from the original report. The existing condition 100-year Rational Method peak flow rate was 171.9 cfs while the proposed 100-year peak flow rate to the detention basin was 713.7 cfs.

See Appendix "A" for reference material from original hydrology study including Rational Method Calculations and hydrograph and basin routing. Also included are the construction plans for the basins.

Proposed Basin Analysis

The proposed project site will utilize a portion of the space currently occupied by the existing detention basin. To accommodate the proposed building, the detention basin will be relocated to the northeasterly portion of the site. Here, the proposed basin is deeper than the existing basin to hold approximately the same volume. In addition, the 27.0 acres at node 221 and the 20.0 acres at node 231, from the Master Plan hydrology map, will be included as commercial development. The total area to the new detention basin is

approximately 291.3 acres (approximately 15.5 acres less than the Master Plan of Drainage hydrology calculations due to some area at node 341 that cannot flow to the basin). Conservatively, all areas are considered as commercial development even though there are several areas of residential homes and vacant lots.

Discharge from the proposed basin is limited by a proposed 36" diameter C.M.P. riser. Discharge rates are based on the orifice equation with head equal to depths above the riser elevations. Runoff discharges to the proposed public storm drain system that traverses through the project site then downstream in Norman Road. The detention analysis shows that approximately 125.1 cfs can discharge from the detention basin. The detained volume is approximately 28.43 acre-feet at depth of about 14.50'.

This peak flow rate is less than the existing condition peak flow rate that currently discharges to Norman Road. The proposed detention basin and public storm drain system provides significant relief to Norman Road and adjacent areas. The basin has positive drainage and basin routing shows that the basin can drain within 24 hours after the peak flow rate is achieved.

See Appendix "D" for detention calculations.

Methodology

Hydrology calculations were computed using San Bernardino County Rational Method program (by AES Software). AES Software's Flood program was used for the detention analysis. The Soil type is "B" for the San Bernadino County Hydrology Manual. Rainfall values are from the San Bernardino County Hydrology Manual isohyetal maps.

APPENDIX

DESCRIPTION

A	REFERENCE MATERIALS
B	HYDROLOGY CALCULATIONS
C	HYDRAULIC CALCULATIONS
D	DETENTION CALCULATIONS
E	CATCH BASIN CALCULATIONS
F	HYDROLOGY MAP

APPENDIX A

REFERENCE MATERIALS

HYDROLOGY & HYDRAULIC CALCULATIONS

FOR

GATEWAY NORTH & CENTRAL
AVENUE STORM DRAIN
CENTRAL AVENUE W/O TIPPECANOE AVNEUE
SAN BERNARDINO CALIFORNIA

PREPARED FOR

HILLWOOD INVESTMENTS
275 SOUTH MEMORIAL DRIVE
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(909) 382-0033

JULY 27, 2005
REVISED DECEMBER 15, 2005

JOB NO. 2537

PREPARED BY

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
(c) Copyright 1983-99 Advanced Engineering Software (aes)
Ver. 8.0 Release Date: 01/01/99 License ID 1435

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* MASTER PLANNED STORM DRAIN *
* 100-YEAR *

FILE NAME: C:\XDRIVE\2585\2585B.DAT
TIME/DATE OF STUDY: 16:35 12/14/2005

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2800

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

FLOW PROCESS FROM NODE 214.00 TO NODE 214.00 IS CODE = 7

>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<

USER-SPECIFIED VALUES ARE AS FOLLOWS:
TC(MIN.) = 16.56 RAINFALL INTENSITY(INCH/HR) = 2.77
EFFECTIVE AREA(ACRES) = 96.41
TOTAL AREA(ACRES) = 104.80 PEAK FLOW RATE(CFS) = 264.00
AREA-AVERAGED Fm(INCH/HR) = 0.09 AREA-AVERAGED Fp(INCH/HR) = 0.85
AREA-AVERAGED Ap = 0.10
NOTE: EFFECTIVE AREA IS USED AS THE TOTAL CONTRIBUTING AREA FOR ALL
CONFLUENCE ANALYSES.

FLOW PROCESS FROM NODE 214.00 TO NODE 221.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1024.34 DOWNSTREAM(FEET) = 1022.45
FLOW LENGTH(FEET) = 448.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 72.0 INCH PIPE IS 58.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 10.81
ESTIMATED PIPE DIAMETER(INCH) = 72.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 264.00
PIPE TRAVEL TIME(MIN.) = 0.69 Tc(MIN.) = 17.25
LONGEST FLOWPATH FROM NODE 214.00 TO NODE 221.00 = 448.00 FEET.

FLOW PROCESS FROM NODE 221.00 TO NODE 221.00 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.) = 17.25
RAINFALL INTENSITY(INCH/HR) = 2.70
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.85
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 96.41

TOTAL STREAM AREA(ACRES) = 104.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 264.00

FLOW PROCESS FROM NODE 220.00 TO NODE 221.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 2400.00
ELEVATION DATA: UPSTREAM(FEET) = 1049.00 DOWNSTREAM(FEET) = 1035.00

Tc = K * [(LENGTH** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 19.133
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.541
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 27.00 0.80 0.10 52 19.13
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA RUNOFF(CFS) = 59.82
TOTAL AREA(ACRES) = 27.00 PEAK FLOW RATE(CFS) = 59.82

FLOW PROCESS FROM NODE 221.00 TO NODE 221.00 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.) = 19.13
RAINFALL INTENSITY(INCH/HR) = 2.54
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 27.00
TOTAL STREAM AREA(ACRES) = 27.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 59.82

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	264.00	17.25	2.704	0.85(0.08)	0.10	96.4	214.00
2	59.82	19.13	2.541	0.80(0.08)	0.10	27.0	220.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	321.50	17.25	2.704	0.84(0.08)	0.10	120.8	214.00
2	307.40	19.13	2.541	0.84(0.08)	0.10	123.4	220.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 321.50 Tc(MIN.) = 17.25
EFFECTIVE AREA(ACRES) = 120.75 AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.84 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 131.80
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 221.00 = 2400.00 FEET.

FLOW PROCESS FROM NODE 221.00 TO NODE 231.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1022.35 DOWNSTREAM(FEET) = 1019.75
FLOW LENGTH(FEET) = 600.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 78.0 INCH PIPE IS 61.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.54
ESTIMATED PIPE DIAMETER(INCH) = 78.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 321.50
PIPE TRAVEL TIME(MIN.) = 0.87 Tc(MIN.) = 18.12
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 231.00 = 3000.00 FEET.

FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 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.) = 18.12
RAINFALL INTENSITY(INCH/HR) = 2.63
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.84
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 120.75
TOTAL STREAM AREA(ACRES) = 131.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 321.50

FLOW PROCESS FROM NODE 230.00 TO NODE 231.00 IS CODE = 21

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

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 2100.00
ELEVATION DATA: UPSTREAM(FEET) = 1040.00 DOWNSTREAM(FEET) = 1029.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 18.532
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.590
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 20.00 0.80 0.10 52 18.53
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA RUNOFF(CFS) = 45.19
TOTAL AREA(ACRES) = 20.00 PEAK FLOW RATE(CFS) = 45.19

FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 1

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

=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 18.53
RAINFALL INTENSITY(INCH/HR) = 2.59
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 20.00
TOTAL STREAM AREA(ACRES) = 20.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 45.19

** CONFLUENCE DATA **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 321.50 18.12 2.626 0.84(0.08) 0.10 120.8 214.00
1 307.40 20.00 2.474 0.84(0.08) 0.10 123.4 220.00
2 45.19 18.53 2.590 0.80(0.08) 0.10 20.0 230.00

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

** PEAK FLOW RATE TABLE **
STREAM Q Tc Intensity Fp(Fm) Ap Ae HEADWATER
NUMBER (CFS) (MIN.) (INCH/HR) (INCH/HR) (ACRES) NODE
1 366.31 18.12 2.626 0.83(0.08) 0.10 140.3 214.00
2 350.50 20.00 2.474 0.83(0.08) 0.10 143.4 220.00
3 363.59 18.53 2.590 0.83(0.08) 0.10 141.3 230.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 366.31 Tc(MIN.) = 18.12
EFFECTIVE AREA(ACRES) = 140.31 AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.83 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 151.80
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 231.00 = 3000.00 FEET.

FLOW PROCESS FROM NODE 231.00 TO NODE 241.00 IS CODE = 31

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

>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

ELEVATION DATA: UPSTREAM(FEET) = 1019.75 DOWNSTREAM(FEET) = 1017.56
FLOW LENGTH(FEET) = 355.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 78.0 INCH PIPE IS 58.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.71
ESTIMATED PIPE DIAMETER(INCH) = 78.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 366.31
PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 18.55
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 241.00 = 3355.00 FEET.

FLOW PROCESS FROM NODE 241.00 TO NODE 241.00 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.) = 18.55
RAINFALL INTENSITY(INCH/HR) = 2.59
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.83
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 140.31
TOTAL STREAM AREA(ACRES) = 151.80
PEAK FLOW RATE(CFS) AT CONFLUENCE = 366.31

FLOW PROCESS FROM NODE 240.00 TO NODE 241.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1400.00
ELEVATION DATA: UPSTREAM(FEET) = 1039.00 DOWNSTREAM(FEET) = 1029.00

Tc = K*{(LENGTH** 3.00)/(ELEVATION CHANGE)**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 14.810
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.963
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 6.00 0.80 0.10 52 14.81
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA RUNOFF(CFS) = 15.57
TOTAL AREA(ACRES) = 6.00 PEAK FLOW RATE(CFS) = 15.57

FLOW PROCESS FROM NODE 241.00 TO NODE 241.00 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.) = 14.81
RAINFALL INTENSITY(INCH/HR) = 2.96
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 6.00
TOTAL STREAM AREA(ACRES) = 6.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 15.57

** CONFLUENCE DATA **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 4 rows of data for streams 1 and 2.

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

** PEAK FLOW RATE TABLE **

Table with 8 columns: STREAM NUMBER, Q (CFS), Tc (MIN.), Intensity (INCH/HR), Fp(Fm) (INCH/HR), Ap, Ae (ACRES), HEADWATER NODE. Contains 1 row of data for stream 1.

2	376.96	18.96	2.555	0.83(0.08)	0.10	147.3	230.00
3	363.26	20.44	2.442	0.83(0.08)	0.10	149.4	220.00
4	351.74	14.81	2.963	0.83(0.08)	0.10	118.0	240.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 379.86 Tc(MIN.) = 18.55
 EFFECTIVE AREA(ACRES) = 146.31 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.83 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 157.80
 LONGEST FLOWPATH FROM NODE 220.00 TO NODE 241.00 = 3355.00 FEET.

 FLOW PROCESS FROM NODE 241.00 TO NODE 251.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1017.06 DOWNSTREAM(FEET) = 1013.47
 FLOW LENGTH(FEET) = 704.00 MANNING'S N = 0.013
 DEPTH OF FLOW IN 81.0 INCH PIPE IS 62.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.82
 ESTIMATED PIPE DIAMETER(INCH) = 81.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 379.86
 PIPE TRAVEL TIME(MIN.) = 0.91 Tc(MIN.) = 19.46
 LONGEST FLOWPATH FROM NODE 220.00 TO NODE 251.00 = 4059.00 FEET.

 FLOW PROCESS FROM NODE 251.00 TO NODE 251.00 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.) = 19.46
 RAINFALL INTENSITY(INCH/HR) = 2.52
 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.83
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 146.31
 TOTAL STREAM AREA(ACRES) = 157.80
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 379.86

 FLOW PROCESS FROM NODE 250.00 TO NODE 251.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 1700.00
 ELEVATION DATA: UPSTREAM(FEET) = 1038.00 DOWNSTREAM(FEET) = 1025.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 15.789
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.852
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	33.00	0.80	0.10	52	15.79

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
 SUBAREA RUNOFF(CFS) = 82.33
 TOTAL AREA(ACRES) = 33.00 PEAK FLOW RATE(CFS) = 82.33

 FLOW PROCESS FROM NODE 251.00 TO NODE 251.00 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.) = 15.79
 RAINFALL INTENSITY(INCH/HR) = 2.85
 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.80
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 33.00
 TOTAL STREAM AREA(ACRES) = 33.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 82.33

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	379.86	19.46	2.515	0.83 (0.08)	0.10	146.3	214.00
1	376.96	19.88	2.483	0.83 (0.08)	0.10	147.3	230.00
1	363.26	21.38	2.377	0.83 (0.08)	0.10	149.4	220.00
1	351.74	15.75	2.856	0.83 (0.08)	0.10	118.0	240.00
2	82.33	15.79	2.852	0.80 (0.08)	0.10	33.0	250.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	433.98	15.75	2.856	0.82 (0.08)	0.10	150.9	240.00
2	452.19	19.46	2.515	0.83 (0.08)	0.10	179.3	214.00
3	448.35	19.88	2.483	0.82 (0.08)	0.10	180.3	230.00
4	431.51	21.38	2.377	0.82 (0.08)	0.10	182.4	220.00
5	434.39	15.79	2.852	0.82 (0.08)	0.10	151.3	250.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 452.19 Tc (MIN.) = 19.46
EFFECTIVE AREA (ACRES) = 179.31 AREA-AVERAGED Fm (INCH/HR) = 0.08
AREA-AVERAGED Fp (INCH/HR) = 0.83 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 190.80
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 251.00 = 4059.00 FEET.

FLOW PROCESS FROM NODE 251.00 TO NODE 252.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM (FEET) = 1012.47 DOWNSTREAM (FEET) = 1011.30
FLOW LENGTH (FEET) = 153.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 81.0 INCH PIPE IS 60.9 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 15.66
ESTIMATED PIPE DIAMETER (INCH) = 81.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 452.19
PIPE TRAVEL TIME (MIN.) = 0.16 Tc (MIN.) = 19.63
LONGEST FLOWPATH FROM NODE 220.00 TO NODE 252.00 = 4212.00 FEET.

FLOW PROCESS FROM NODE 252.00 TO NODE 252.00 IS CODE = 10

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

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1050.00
ELEVATION DATA: UPSTREAM (FEET) = 1056.00 DOWNSTREAM (FEET) = 1047.00

Tc = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20
SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 12.727
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 3.245
SUBAREA Tc AND LOSS RATE DATA (AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 12.00 0.80 0.10 52 12.73
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA RUNOFF (CFS) = 34.19
TOTAL AREA (ACRES) = 12.00 PEAK FLOW RATE (CFS) = 34.19

FLOW PROCESS FROM NODE 301.00 TO NODE 302.00 IS CODE = 61

>>>> COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>> (STANDARD CURB SECTION USED)<<<<<

UPSTREAM ELEVATION (FEET) = 1047.00 DOWNSTREAM ELEVATION (FEET) = 1040.00
STREET LENGTH (FEET) = 800.00 CURB HEIGHT (INCHES) = 8.0
STREET HALFWIDTH (FEET) = 20.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK (FEET) = 15.00
INSIDE STREET CROSSFALL (DECIMAL) = 0.020
OUTSIDE STREET CROSSFALL (DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
STREET PARKWAY CROSSFALL (DECIMAL) = 0.020
Manning's FRICTION FACTOR for Streetflow Section (curb-to-curb) = 0.0149
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

**TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) = 49.08
STREET FLOWING FULL

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH (FEET) = 0.65
HALFSTREET FLOOD WIDTH (FEET) = 20.00
AVERAGE FLOW VELOCITY (FEET/SEC.) = 4.08
PRODUCT OF DEPTH&VELOCITY (FT*FT/SEC.) = 2.65
STREET FLOW TRAVEL TIME (MIN.) = 3.26 Tc (MIN.) = 15.99
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.830

SUBAREA LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	12.00	0.80	0.10	52

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA AREA (ACRES) = 12.00 SUBAREA RUNOFF (CFS) = 29.70
EFFECTIVE AREA (ACRES) = 24.00 AREA-AVERAGED Fm (INCH/HR) = 0.08
AREA-AVERAGED Fp (INCH/HR) = 0.80 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 24.00 PEAK FLOW RATE (CFS) = 59.40

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH (FEET) = 0.69 HALFSTREET FLOOD WIDTH (FEET) = 20.96
FLOW VELOCITY (FEET/SEC.) = 4.40 DEPTH*VELOCITY (FT*FT/SEC.) = 3.02
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 302.00 = 1850.00 FEET.

FLOW PROCESS FROM NODE 302.00 TO NODE 303.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM (FEET) = 1035.00 DOWNSTREAM (FEET) = 1033.50
FLOW LENGTH (FEET) = 300.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 42.0 INCH PIPE IS 29.9 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 8.10
ESTIMATED PIPE DIAMETER (INCH) = 42.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 59.40
PIPE TRAVEL TIME (MIN.) = 0.62 Tc (MIN.) = 16.61
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 303.00 = 2150.00 FEET.

FLOW PROCESS FROM NODE 303.00 TO NODE 303.00 IS CODE = 81

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

=====

MAINLINE Tc (MIN) = 16.61
* 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.766
SUBAREA LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	A	19.00	0.80	0.10	52

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA AREA (ACRES) = 19.00 SUBAREA RUNOFF (CFS) = 45.94
EFFECTIVE AREA (ACRES) = 43.00 AREA-AVERAGED Fm (INCH/HR) = 0.08
AREA-AVERAGED Fp (INCH/HR) = 0.80 AREA-AVERAGED Ap = 0.10
TOTAL AREA (ACRES) = 43.00 PEAK FLOW RATE (CFS) = 103.97

FLOW PROCESS FROM NODE 303.00 TO NODE 311.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM (FEET) = 1033.50 DOWNSTREAM (FEET) = 1031.50
FLOW LENGTH (FEET) = 400.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 51.0 INCH PIPE IS 37.6 INCHES
PIPE-FLOW VELOCITY (FEET/SEC.) = 9.27
ESTIMATED PIPE DIAMETER (INCH) = 51.00 NUMBER OF PIPES = 1
PIPE-FLOW (CFS) = 103.97
PIPE TRAVEL TIME (MIN.) = 0.72 Tc (MIN.) = 17.33

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 311.00 = 2550.00 FEET.

FLOW PROCESS FROM NODE 311.00 TO NODE 311.00 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.) = 17.33
RAINFALL INTENSITY(INCH/HR) = 2.70
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 43.00
TOTAL STREAM AREA(ACRES) = 43.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 103.97

FLOW PROCESS FROM NODE 310.00 TO NODE 311.00 IS CODE = 21

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

=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 1400.00
ELEVATION DATA: UPSTREAM(FEET) = 1042.00 DOWNSTREAM(FEET) = 1038.00

Tc = K * {(LENGTH** 3.00)/(ELEVATION CHANGE)**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 17.788
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.655
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL A 17.00 0.80 0.10 52 17.79
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA RUNOFF(CFS) = 39.40
TOTAL AREA(ACRES) = 17.00 PEAK FLOW RATE(CFS) = 39.40

FLOW PROCESS FROM NODE 311.00 TO NODE 311.00 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.) = 17.79
RAINFALL INTENSITY(INCH/HR) = 2.65
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 17.00
TOTAL STREAM AREA(ACRES) = 17.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 39.40

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	103.97	17.33	2.697	0.80(0.08)	0.10	43.0	300.00
2	39.40	17.79	2.655	0.80(0.08)	0.10	17.0	310.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	142.98	17.33	2.697	0.80(0.08)	0.10	59.6	300.00
2	141.70	17.79	2.655	0.80(0.08)	0.10	60.0	310.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 142.98 Tc(MIN.) = 17.33
EFFECTIVE AREA(ACRES) = 59.56 AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 60.00
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 311.00 = 2550.00 FEET.

FLOW PROCESS FROM NODE 311.00 TO NODE 312.00 IS CODE = 31

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1031.50 DOWNSTREAM(FEET) = 1030.50
FLOW LENGTH(FEET) = 150.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 40.6 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 11.16
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 142.98
PIPE TRAVEL TIME(MIN.) = 0.22 Tc(MIN.) = 17.55
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 312.00 = 2700.00 FEET.

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*****
FLOW PROCESS FROM NODE 312.00 TO NODE 312.00 IS CODE = 81
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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN) = 17.55
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.676
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL              A      8.00     0.80      0.10      52
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
SUBAREA AREA(ACRES) = 8.00 SUBAREA RUNOFF(CFS) = 18.69
EFFECTIVE AREA(ACRES) = 67.56 AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 68.00 PEAK FLOW RATE(CFS) = 157.88

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*****
FLOW PROCESS FROM NODE 312.00 TO NODE 321.00 IS CODE = 31
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>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1030.50 DOWNSTREAM(FEET) = 1020.00
FLOW LENGTH(FEET) = 1200.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 54.0 INCH PIPE IS 39.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 12.72
ESTIMATED PIPE DIAMETER(INCH) = 54.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 157.88
PIPE TRAVEL TIME(MIN.) = 1.57 Tc(MIN.) = 19.12
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 321.00 = 3900.00 FEET.

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*****
FLOW PROCESS FROM NODE 321.00 TO NODE 321.00 IS CODE = 1
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>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 19.12
RAINFALL INTENSITY(INCH/HR) = 2.54
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 67.56
TOTAL STREAM AREA(ACRES) = 68.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 157.88

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*****
FLOW PROCESS FROM NODE 320.00 TO NODE 321.00 IS CODE = 21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====

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INITIAL SUBAREA FLOW-LENGTH(FEET) = 1000.00
ELEVATION DATA: UPSTREAM(FEET) = 1042.00 DOWNSTREAM(FEET) = 1035.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.997
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.205
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/      SCS SOIL  AREA      Fp        Ap      SCS  Tc
LAND USE                GROUP  (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
COMMERCIAL              A      11.00     0.80      0.10      52  13.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10

```

SUBAREA RUNOFF(CFS) = 30.94
TOTAL AREA(ACRES) = 11.00 PEAK FLOW RATE(CFS) = 30.94

FLOW PROCESS FROM NODE 321.00 TO NODE 321.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 13.00
RAINFALL INTENSITY(INCH/HR) = 3.20
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 11.00
TOTAL STREAM AREA(ACRES) = 11.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 30.94

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	157.88	19.12	2.542	0.80(0.08)	0.10	67.6	300.00
1	156.38	19.59	2.506	0.80(0.08)	0.10	68.0	310.00
2	30.94	13.00	3.205	0.80(0.08)	0.10	11.0	320.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	182.25	19.12	2.542	0.80(0.08)	0.10	78.6	300.00
2	180.40	19.59	2.506	0.80(0.08)	0.10	79.0	310.00
3	167.12	13.00	3.205	0.80(0.08)	0.10	56.9	320.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 182.25 Tc(MIN.) = 19.12
EFFECTIVE AREA(ACRES) = 78.56 AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 79.00
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 321.00 = 3900.00 FEET.

FLOW PROCESS FROM NODE 321.00 TO NODE 331.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1020.00 DOWNSTREAM(FEET) = 1012.00
FLOW LENGTH(FEET) = 900.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 57.0 INCH PIPE IS 41.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.28
ESTIMATED PIPE DIAMETER(INCH) = 57.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 162.25
PIPE TRAVEL TIME(MIN.) = 1.13 Tc(MIN.) = 20.25
LONGEST FLOWPATH FROM NODE 300.00 TO NODE 331.00 = 4800.00 FEET.

FLOW PROCESS FROM NODE 331.00 TO NODE 331.00 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.) = 20.25
RAINFALL INTENSITY(INCH/HR) = 2.46
AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.80
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 78.56
TOTAL STREAM AREA(ACRES) = 79.00
PEAK FLOW RATE(CFS) AT CONFLUENCE = 182.25

FLOW PROCESS FROM NODE 330.00 TO NODE 331.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 950.00
 ELEVATION DATA: UPSTREAM(FEET) = 1033.00 DOWNSTREAM(FEET) = 1027.00

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.998
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.205
 SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	11.00	0.80	0.10	52	13.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
 SUBAREA RUNOFF(CFS) = 30.94
 TOTAL AREA(ACRES) = 11.00 PEAK FLOW RATE(CFS) = 30.94

 FLOW PROCESS FROM NODE 331.00 TO NODE 331.00 IS CODE = 1

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

=====

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION(MIN.) = 13.00
 RAINFALL INTENSITY(INCH/HR) = 3.20
 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.80
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 11.00
 TOTAL STREAM AREA(ACRES) = 11.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 30.94

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	182.25	20.25	2.456	0.80(0.08)	0.10	78.6	300.00
1	180.40	20.75	2.421	0.80(0.08)	0.10	79.0	310.00
1	167.12	14.16	3.044	0.80(0.08)	0.10	56.9	320.00
2	30.94	13.00	3.205	0.80(0.08)	0.10	11.0	330.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	196.47	14.16	3.044	0.80(0.08)	0.10	67.9	320.00
2	205.78	20.25	2.456	0.80(0.08)	0.10	89.6	300.00
3	203.57	20.75	2.421	0.80(0.08)	0.10	90.0	310.00
4	192.65	13.00	3.205	0.80(0.08)	0.10	63.2	330.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 205.78 Tc(MIN.) = 20.25
 EFFECTIVE AREA(ACRES) = 89.56 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.80 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 90.00
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 331.00 = 4800.00 FEET.

 FLOW PROCESS FROM NODE 331.00 TO NODE 331.00 IS CODE = 11

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

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	192.65	13.00	3.205	0.80(0.08)	0.10	63.2	330.00
2	196.47	14.16	3.044	0.80(0.08)	0.10	67.9	320.00
3	205.78	20.25	2.456	0.80(0.08)	0.10	89.6	300.00
4	203.57	20.75	2.421	0.80(0.08)	0.10	90.0	310.00

LONGEST FLOWPATH FROM NODE 300.00 TO NODE 331.00 = 4800.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	433.98	15.91	2.838	0.82(0.08)	0.10	150.9	240.00
2	434.39	15.96	2.834	0.82(0.08)	0.10	151.3	250.00
3	452.19	19.63	2.503	0.83(0.08)	0.10	179.3	214.00

4 448.35 20.04 2.471 0.82(0.08) 0.10 180.3 230.00
 5 431.51 21.55 2.366 0.82(0.08) 0.10 182.4 220.00
 LONGEST FLOWPATH FROM NODE 0.00 TO NODE 331.00 = 0.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	594.26	13.00	3.205	0.81(0.08)	0.10	186.5	330.00
2	611.50	14.16	3.044	0.81(0.08)	0.10	202.2	320.00
3	651.75	20.25	2.456	0.82(0.08)	0.10	270.2	300.00
4	644.05	20.75	2.421	0.82(0.08)	0.10	271.3	310.00
5	633.13	15.91	2.838	0.81(0.08)	0.10	225.1	240.00
6	633.60	15.96	2.834	0.81(0.08)	0.10	225.6	250.00
7	657.01	19.63	2.503	0.82(0.08)	0.10	266.6	214.00
8	653.80	20.04	2.471	0.82(0.08)	0.10	269.1	230.00
9	630.35	21.55	2.366	0.82(0.08)	0.10	272.4	220.00
TOTAL AREA (ACRES) = 280.80							

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE (CFS) = 657.01 Tc (MIN.) = 19.627
 EFFECTIVE AREA (ACRES) = 266.64 AREA-AVERAGED Fm (INCH/HR) = 0.08
 AREA-AVERAGED Fp (INCH/HR) = 0.82 AREA-AVERAGED Ap = 0.10
 TOTAL AREA (ACRES) = 280.80
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 331.00 = 4800.00 FEET.

 FLOW PROCESS FROM NODE 331.00 TO NODE 331.00 IS CODE = 12

>>>>CLEAR MEMORY BANK # 1 <<<<<

 FLOW PROCESS FROM NODE 331.00 TO NODE 331.00 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.) = 19.63
 RAINFALL INTENSITY (INCH/HR) = 2.50
 AREA-AVERAGED Fm (INCH/HR) = 0.08
 AREA-AVERAGED Fp (INCH/HR) = 0.82
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA (ACRES) = 266.64
 TOTAL STREAM AREA (ACRES) = 280.80
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 657.01

 FLOW PROCESS FROM NODE 340.00 TO NODE 341.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH (FEET) = 1600.00
 ELEVATION DATA: UPSTREAM (FEET) = 1027.00 DOWNSTREAM (FEET) = 1022.00

$Tc = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
 SUBAREA ANALYSIS USED MINIMUM Tc (MIN.) = 18.431
 * 100 YEAR RAINFALL INTENSITY (INCH/HR) = 2.599
 SUBAREA Tc AND LOSS RATE DATA (AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	26.00	0.80	0.10	52	18.43

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp (INCH/HR) = 0.80
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.10
 SUBAREA RUNOFF (CFS) = 58.95
 TOTAL AREA (ACRES) = 26.00 PEAK FLOW RATE (CFS) = 58.95

 FLOW PROCESS FROM NODE 341.00 TO NODE 341.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
 TIME OF CONCENTRATION (MIN.) = 18.43
 RAINFALL INTENSITY (INCH/HR) = 2.60
 AREA-AVERAGED Fm (INCH/HR) = 0.08
 AREA-AVERAGED Fp (INCH/HR) = 0.80

AREA-AVERAGED $A_p = 0.10$
 EFFECTIVE STREAM AREA(ACRES) = 26.00
 TOTAL STREAM AREA(ACRES) = 26.00
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 58.95

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	594.26	13.00	3.205	0.81(0.08)	0.10	186.5	330.00
1	611.50	14.16	3.044	0.81(0.08)	0.10	202.2	320.00
1	651.75	20.25	2.456	0.82(0.08)	0.10	270.2	300.00
1	644.05	20.75	2.421	0.82(0.08)	0.10	271.3	310.00
1	633.13	15.91	2.838	0.81(0.08)	0.10	225.1	240.00
1	633.60	15.96	2.834	0.81(0.08)	0.10	225.6	250.00
1	657.01	19.63	2.503	0.82(0.08)	0.10	266.6	214.00
1	653.80	20.04	2.471	0.82(0.08)	0.10	269.1	230.00
1	630.35	21.55	2.366	0.82(0.08)	0.10	272.4	220.00
2	58.95	18.43	2.599	0.80(0.08)	0.10	26.0	340.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	645.83	13.00	3.205	0.81(0.08)	0.10	204.9	330.00
2	664.79	14.16	3.044	0.81(0.08)	0.10	222.2	320.00
3	688.86	15.91	2.838	0.81(0.08)	0.10	247.5	240.00
4	689.39	15.96	2.834	0.81(0.08)	0.10	248.1	250.00
5	713.71	19.63	2.503	0.81(0.08)	0.10	292.6	214.00
6	709.77	20.04	2.471	0.81(0.08)	0.10	295.1	230.00
7	707.36	20.25	2.456	0.81(0.08)	0.10	296.2	300.00
8	698.83	20.75	2.421	0.81(0.08)	0.10	297.3	310.00
9	683.86	21.55	2.366	0.81(0.08)	0.10	298.4	220.00
10	708.34	18.43	2.599	0.81(0.08)	0.10	279.3	340.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 713.71 Tc(MIN.) = 19.63
 EFFECTIVE AREA(ACRES) = 292.64 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.81 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 306.80
 LONGEST FLOWPATH FROM NODE 300.00 TO NODE 341.00 = 4800.00 FEET.

=====
 END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 306.80 TC(MIN.) = 19.63
 EFFECTIVE AREA(ACRES) = 292.64 AREA-AVERAGED Fm(INCH/HR) = 0.08
 AREA-AVERAGED Fp(INCH/HR) = 0.81 AREA-AVERAGED Ap = 0.10
 PEAK FLOW RATE(CFS) = 713.71

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	645.83	13.00	3.205	0.81(0.08)	0.10	204.9	330.00
2	664.79	14.16	3.044	0.81(0.08)	0.10	222.2	320.00
3	688.86	15.91	2.838	0.81(0.08)	0.10	247.5	240.00
4	689.39	15.96	2.834	0.81(0.08)	0.10	248.1	250.00
5	708.34	18.43	2.599	0.81(0.08)	0.10	279.3	340.00
6	713.71	19.63	2.503	0.81(0.08)	0.10	292.6	214.00
7	709.77	20.04	2.471	0.81(0.08)	0.10	295.1	230.00
8	707.36	20.25	2.456	0.81(0.08)	0.10	296.2	300.00
9	698.83	20.75	2.421	0.81(0.08)	0.10	297.3	310.00
10	683.86	21.55	2.366	0.81(0.08)	0.10	298.4	220.00

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 END OF RATIONAL METHOD ANALYSIS

 FLOOD ROUTING ANALYSIS
 USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO (1986)
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Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
 * DETENTION BASIN SOUTH OF CENTRAL *
 * WEST OF VALLEY VIEW *
 * 100-YEAR INTERIM CONDITION *

FILE NAME: C:\XDRIVE\2585\BASIN.DAT
 TIME/DATE OF STUDY: 13:54 07/25/2005

 FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 1

>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<

(UNIT-HYDROGRAPH ADDED TO STREAM #1)

WATERSHED AREA = 242.000 ACRES
 BASEFLOW = 0.000 CFS/SQUARE-MILE
 *USER ENTERED "LAG" TIME = 0.270 HOURS
 CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
 THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
 MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
 VALLEY (DEVELOPED) S-GRAPH SELECTED
 MAXIMUM WATERSHED LOSS RATE (INCH/HOUR) = 0.074
 LOW LOSS FRACTION = 0.127
 HYDROGRAPH MODEL #1 SPECIFIED

— DOES NOT INCLUDE 27.0 ACRES @ Node 221,
 20.0 ACRES @ 221, + 18.0 AC (426) @ 341

SPECIFIED PEAK 5-MINUTES RAINFALL (INCH) = 0.48
 SPECIFIED PEAK 30-MINUTES RAINFALL (INCH) = 1.00
 SPECIFIED PEAK 1-HOUR RAINFALL (INCH) = 1.30
 SPECIFIED PEAK 3-HOUR RAINFALL (INCH) = 1.90
 SPECIFIED PEAK 6-HOUR RAINFALL (INCH) = 2.50
 SPECIFIED PEAK 24-HOUR RAINFALL (INCH) = 5.00

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
 5-MINUTE FACTOR = 0.989
 30-MINUTE FACTOR = 0.989
 1-HOUR FACTOR = 0.989
 3-HOUR FACTOR = 0.998
 6-HOUR FACTOR = 0.999
 24-HOUR FACTOR = 1.000

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES
 UNIT INTERVAL PERCENTAGE OF LAG-TIME = 30.864

RUNOFF HYDROGRAPH LISTING LIMITS:
 MODEL TIME (HOURS) FOR BEGINNING OF RESULTS = 14.00
 MODEL TIME (HOURS) FOR END OF RESULTS = 18.00

UNIT HYDROGRAPH DETERMINATION

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES (CFS)
1	1.944	56.907
2	11.609	282.855
3	30.666	557.750
4	55.910	738.807
5	77.091	619.893

6	88.842	343.931
7	94.763	173.269
8	97.587	82.650
9	98.513	27.097
10	99.091	16.937
11	99.637	15.955
12	99.909	7.977
13	100.000	2.659

TOTAL SOIL-LOSS VOLUME (ACRE-FEET) = 10.9651
TOTAL STORM RUNOFF VOLUME (ACRE-FEET) = 89.7728

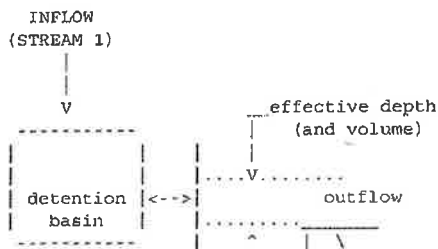
2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS (CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME (HRS)	VOLUME (AF)	Q (CFS)	0.	150.0	300.0	450.0	600.0
14.000	35.0848	48.52	Q		V		
14.083	35.4255	49.48	Q		V		
14.167	35.7702	50.05	Q		V		
14.250	36.1155	50.14	Q		V		
14.333	36.4595	49.94	Q		V		
14.417	36.8041	50.04	Q		V		
14.500	37.1539	50.79	Q		V		
14.583	37.5119	51.98	Q		V		
14.667	37.8801	53.47	Q		V		
14.750	38.2603	55.21	Q		V		
14.833	38.6539	57.14	Q		V		
14.917	39.0619	59.25	Q		V		
15.000	39.4862	61.61	Q		V		
15.083	39.9285	64.22	Q		V		
15.167	40.3912	67.17	Q		V		
15.250	40.8765	70.48	Q		V		
15.333	41.3880	74.26	Q		V		
15.417	41.9302	78.73	Q		V		
15.500	42.5120	84.49	Q		V		
15.583	43.1446	91.84	Q		V		
15.667	43.8409	101.11	Q		V		
15.750	44.6158	112.51	Q		V		
15.833	45.4974	128.01	Q		V		
15.917	46.5326	150.31	Q		V		
16.000	47.8074	185.10	Q		V		
16.083	49.5554	253.81	Q		V		
16.167	52.1958	383.39	Q		V		
16.250	55.7080	509.96	Q		V		
16.333	59.5874	563.30	Q		V		
16.417	62.8784	477.85	Q		V		
16.500	65.1316	327.16	Q		V		
16.583	66.6454	219.80	Q		V		
16.667	67.6995	153.05	Q		V		
16.750	68.4606	110.51	Q		V		
16.833	69.0934	91.89	Q		V		
16.917	69.6509	80.95	Q		V		
17.000	70.1335	70.07	Q		V		
17.083	70.5607	62.04	Q		V		
17.167	70.9520	56.81	Q		V		
17.250	71.3242	54.05	Q		V		
17.333	71.6847	52.33	Q		V		
17.417	72.0347	50.83	Q		V		
17.500	72.3730	49.12	Q		V		
17.583	72.6990	47.34	Q		V		
17.667	73.0131	45.61	Q		V		
17.750	73.3158	43.95	Q		V		
17.833	73.6081	42.44	Q		V		
17.917	73.8910	41.07	Q		V		
18.000	74.1650	39.79	Q		V		

FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 3.1

>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<



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      |         | dead | basin outlet
      v         | storage |
OUTFLOW
(STREAM 1)
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ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
 THROUGH A FLOW-THROUGH DETENTION BASIN
 SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 DEAD STORAGE(AF) = 0.000
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
 SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
 DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	0.50	10.50	0.060
3	1.50	46.50	1.240
4	2.50	88.30	4.680
5	3.50	122.10	10.100
6	4.50	144.60	16.300
7	5.50	163.70	22.700
8	6.50	180.50	29.400

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MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
 (Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
 MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	MEAN		
				EFFECTIVE DEPTH (FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME (AF)
12.083	0.000	42.74	0.00	1.36	41.1	1.070
12.167	0.000	42.29	0.00	1.36	41.4	1.076
12.250	0.000	40.98	0.00	1.36	41.4	1.073
12.333	0.000	39.12	0.00	1.35	41.2	1.058
12.417	0.000	37.63	0.00	1.33	40.6	1.038
12.500	0.000	37.03	0.00	1.31	40.0	1.017
12.583	0.000	36.96	0.00	1.30	39.4	1.000
12.667	0.000	37.20	0.00	1.29	39.0	0.988
12.750	0.000	37.63	0.00	1.28	38.7	0.980
12.833	0.000	38.12	0.00	1.28	38.5	0.978
12.917	0.000	38.62	0.00	1.28	38.5	0.978
13.000	0.000	39.17	0.00	1.28	38.6	0.982
13.083	0.000	39.76	0.00	1.29	38.7	0.989
13.167	0.000	40.39	0.00	1.30	39.0	0.999
13.250	0.000	41.04	0.00	1.31	39.3	1.011
13.333	0.000	41.72	0.00	1.32	39.7	1.025
13.417	0.000	42.43	0.00	1.33	40.2	1.040
13.500	0.000	43.18	0.00	1.35	40.7	1.057
13.583	0.000	43.96	0.00	1.36	41.2	1.076
13.667	0.000	44.78	0.00	1.38	41.8	1.097
13.750	0.000	45.64	0.00	1.40	42.5	1.119
13.833	0.000	46.55	0.00	1.42	43.2	1.142
13.917	0.000	47.51	0.00	1.44	43.9	1.167
14.000	0.000	48.52	0.00	1.46	44.7	1.193
14.083	0.000	49.48	0.00	1.48	45.5	1.221
14.167	0.000	50.05	0.00	1.50	46.2	1.247
14.250	0.000	50.14	0.00	1.51	46.7	1.270
14.333	0.000	49.94	0.00	1.51	47.0	1.291
14.417	0.000	50.04	0.00	1.52	47.2	1.310
14.500	0.000	50.79	0.00	1.53	47.5	1.333
14.583	0.000	51.98	0.00	1.54	47.8	1.362
14.667	0.000	53.47	0.00	1.55	48.2	1.398
14.750	0.000	55.21	0.00	1.56	48.7	1.443
14.833	0.000	57.14	0.00	1.57	49.3	1.497
14.917	0.000	59.25	0.00	1.59	50.0	1.560
15.000	0.000	61.61	0.00	1.61	50.8	1.635
15.083	0.000	64.22	0.00	1.64	51.8	1.720
15.167	0.000	67.17	0.00	1.67	52.9	1.818
15.250	0.000	70.48	0.00	1.70	54.2	1.930
15.333	0.000	74.26	0.00	1.74	55.7	2.058
15.417	0.000	78.73	0.00	1.78	57.3	2.206

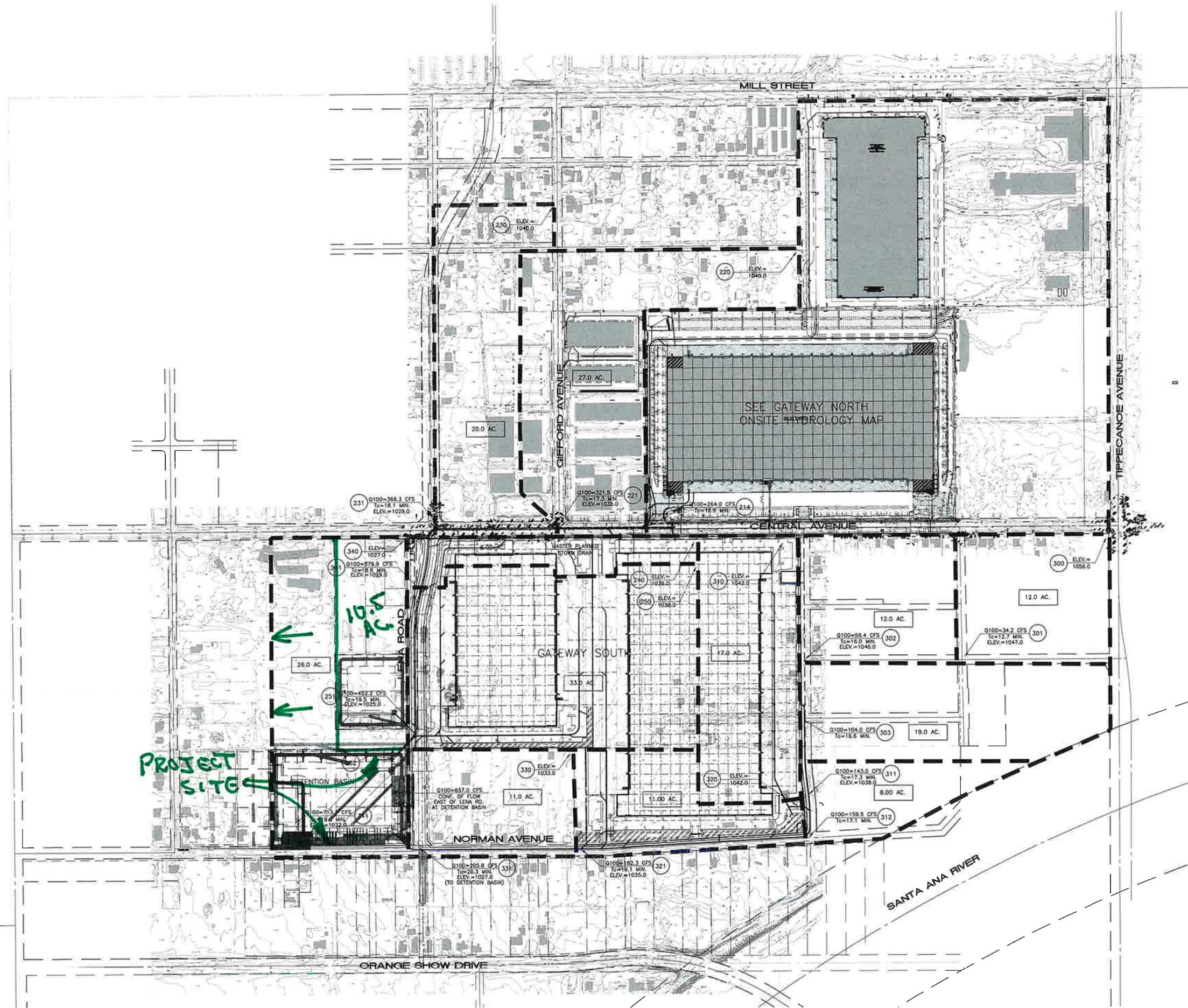
15.500	0.000	84.49	0.00	1.83	59.3	2.379
15.583	0.000	91.84	0.00	1.89	61.6	2.587
15.667	0.000	101.11	0.00	1.97	64.4	2.840
15.750	0.000	112.51	0.00	2.05	67.8	3.148
15.833	0.000	128.01	0.00	2.17	72.0	3.534
15.917	0.000	150.31	0.00	2.31	77.4	4.036
16.000	0.000	185.10	0.00	2.51	84.5	4.728
16.083	0.000	253.81	0.00	2.71	92.1	5.842
16.167	0.000	383.39	0.00	3.07	101.6	7.783
16.250	0.000	509.96	0.00	3.56	115.6	10.499
16.333	0.000	563.30	0.00	4.05	129.0	13.490
16.417	0.000	477.85	0.00	4.42	138.6	15.826
16.500	0.000	327.16	0.00	4.62	144.9	17.081
16.583	0.000	219.80	0.00	4.70	147.7	17.578
16.667	0.000	153.05	0.00	4.70	148.5	17.610
16.750	0.000	110.51	0.00	4.66	148.1	17.351
16.833	0.000	91.89	0.00	4.60	147.2	16.970
16.917	0.000	80.95	0.00	4.53	145.9	16.522
17.000	0.000	70.07	0.00	4.45	144.4	16.010
17.083	0.000	62.04	0.00	4.36	142.5	15.456
17.167	0.000	56.81	0.00	4.27	140.5	14.880
17.250	0.000	54.05	0.00	4.18	138.4	14.299
17.333	0.000	52.33	0.00	4.08	136.3	13.721
17.417	0.000	50.83	0.00	3.99	134.2	13.146
17.500	0.000	49.12	0.00	3.90	132.1	12.575
17.583	0.000	47.34	0.00	3.81	130.0	12.005
17.667	0.000	45.61	0.00	3.72	128.0	11.438
17.750	0.000	43.95	0.00	3.62	125.9	10.873
17.833	0.000	42.44	0.00	3.53	123.9	10.312
17.917	0.000	41.07	0.00	3.44	121.4	9.759
18.000	0.000	39.79	0.00	3.34	118.3	9.218

- Max Depth 4.70
= W.S.E 1025.2

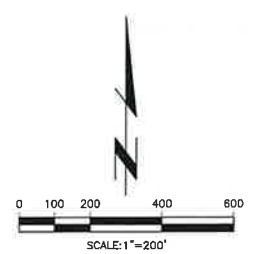
PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 89.773 AF
 BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
 OUTFLOW VOLUME = 89.773 AF
 LOSS VOLUME = 0.000 AF
 =====

END OF FLOODSCX ROUTING ANALYSIS



- - - - - SUBAREA BOUNDARY
 71.0 AC. TRIBUTARY AREA
 100 NODE NUMBER



PROJECT SITE

ORANGE SHOW DRIVE

SANTA ANA RIVER

PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING & LAND SURVEYING
 14349 FRESTONE BLVD.
 LA BUREAU, CALIFORNIA 92445
 (951) 941-4811 FAX (951) 941-4121

OWNER/DEVELOPER:
HILLWOOD INVESTMENTS
275 SOUTH MEMORIAL DRIVE
 SAN BERNARDINO, CA 92408
 TEL: (909) 382-0033
 FAX: (909) 382-0073

**MASTER PLAN STORM DRAIN
 HYDROLOGY MAP**

SHEET
1
 OF
1

Last Update: 12/14/05
N:\2005\200505.dwg

Thienes Engineering, Inc.

CIVIL ENGINEERING • LAND SURVEYING

subject	by	date	job no.	sheet of
---------	----	------	---------	----------

OUTLET Q's @ DETENTION BASIN

USE 15" OUTLETS

$$Q_{out} = .6(ARER)\sqrt{64.4h} \quad h = \text{HEAD} \quad ARER = 1.23$$

h = .5 Q = 2.1 (ARER ≈ 1/2 of 1.23)

h = 1.5 " 7.2

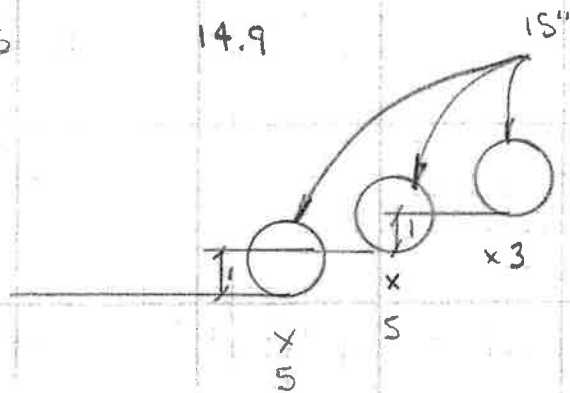
h = 2.5 " 9.2

" 3.5 10.9

" 4.5 12.5

" 5.5 13.7

" 6.5 14.9



Depth = .5' 2.1 x 5 cfs out = 10.5

1.5' (7.2 x 5) + (2.1 x 5) = 46.5

2.5' (9.2 x 5) + (5 x 7.2) + (3 x 2.1) = 46 + 36 + 6.3 = 88.3

3.5' (5 x 10.9) + (5 x 9.2) + (3 x 7.2) = 54.5 + 46 + 21.6 = 122.1

4.5' (5 x 12.5) + (5 x 10.9) + (3 x 9.2) = 62.5 + 54.5 + 27.6 = 144.6

5.5' (5 x 13.7) + (5 x 12.5) + (3 x 10.9) = 68.5 + 62.5 + 32.7 = 163.7

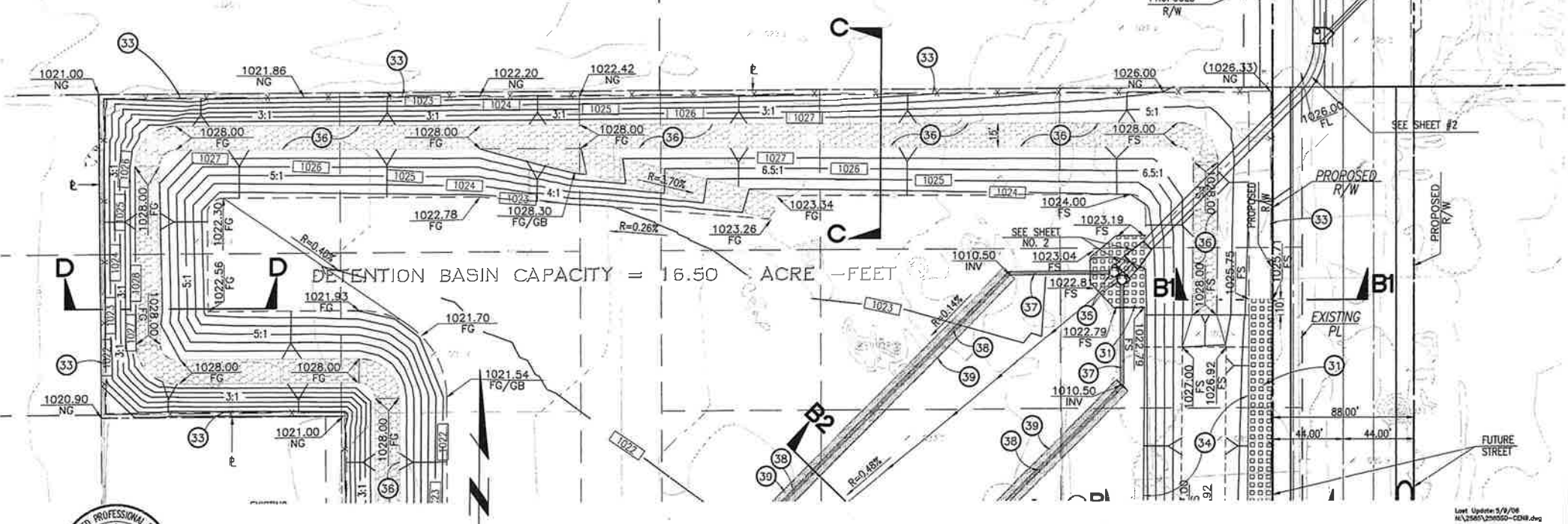
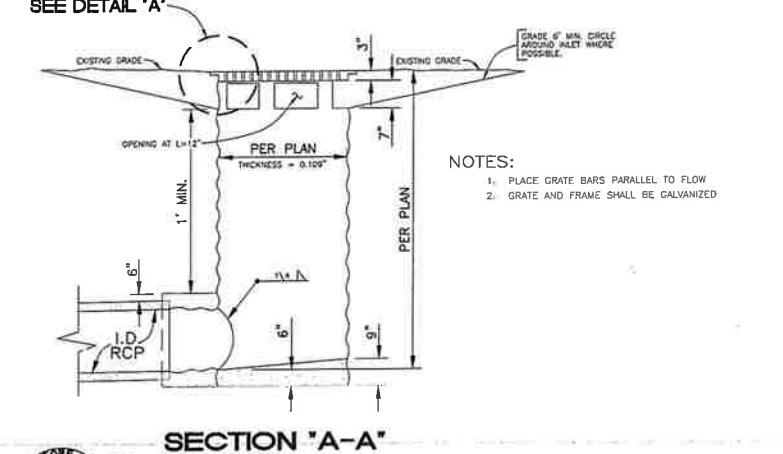
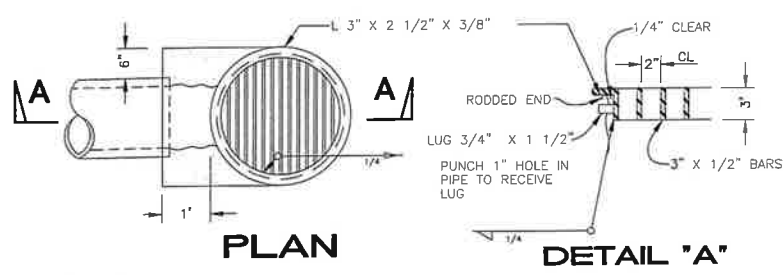
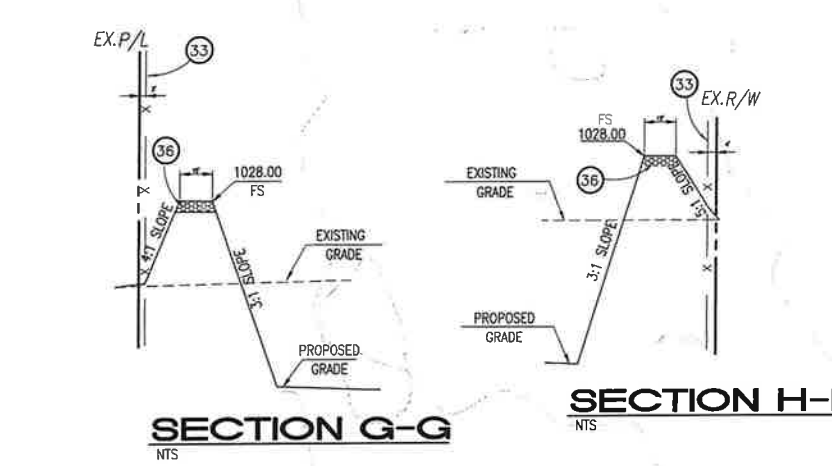
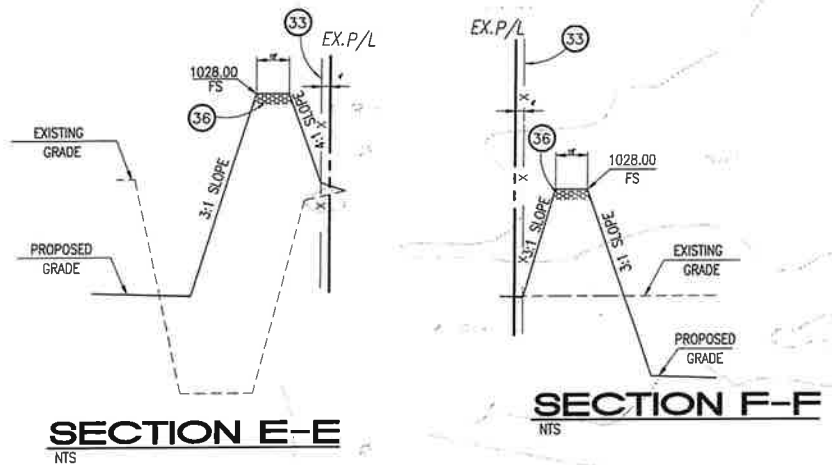
6.5' (5 x 14.9) + (5 x 13.7) + (3 x 12.5) = 74.5 + 68.5 + 37.5 = 180.5

DETENTION BASIN VOLUME

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Q Discharge (cfs)
1020.50	0.00	0	2650	2650	0.06	10.5
1021.00	0.50	10600	51400	54050	1.24	46.5
1022.00	1.50	92200	149800	203850	4.68	88.3
1023.00	2.50	207400	235700	439550	10.09	122.1
1024.00	3.50	264000	269500	709050	16.28	144.6
1025.00	4.50	275000	280500	989550	22.72	163.7
1026.00	5.50	286000	291500	1281050	29.41	180.5
1027.00	6.50	297000				

DETENTION BASIN CONSTRUCTION NOTES

- 50 REMOVE EXISTING CHAIN LINK FENCE.
- 51 INSTALL 24" THICK 200 LB GROUTED RIP-RAP PER CAL TRANS SPECIFICATIONS.
- 52 INSTALL 15" H.D.P.E. N-12 PIPE OR EQUAL.
- 53 INSTALL CHAIN LINK FENCE AND GATE PER CALTRANS STANDARDS ABS.
- 54 INSTALL 4" THICK CONCRETE SPILLWAY.
- 55 INSTALL 60" CMP INLET PER DETAIL ON SHEET NO. 8.
- 56 CONSTRUCT 15' WIDE AND 3" THICK GRAVEL ACCESS ROAD.
- 57 INSTALL 24" H.D.P.E. N-12 PIPE OR EQUAL.
- 58 INSTALL 24" H.D.P.E. N-12 PERFORATED PIPE OR EQUAL.
- 59 INSTALL 5' DEEP AND 10' WIDE 3/4" GRAVEL PER SECTION "B2-B2".
- 60 INSTALL 4" AC PAVEMENT OVER 90% COMPACTED NATIVE SOIL.
- 61 INSTALL 12" CUT OFF WALL PER DETAIL ON SHEET #8.
- 62 INSTALL GRAVITY HEADWALL PER DETAIL ON THIS SHEET.
- 63 INSTALL 12" ROUND H.D.P.E. N-12 AREA DRAIN.
- 64 INSTALL 12" H.D.P.E. N-12 PIPE OR EQUAL.
- 65 CONSTRUCT 66" R.C.P., D PER PLAN.
- 66 SEAL END PIPE PER DETAIL ON SHEET NO. 3.
- 67 CONSTRUCT JUNCTION STRUCTURE PER A.P.W.A. STD. PLAN NO. 331-2.
- 68 INSTALL 24" TEE H.D.P.E. N-12 PERFORATED PIPE OR EQUAL.
- 69 INSTALL 45" BEND H.D.P.E. N-12 PERFORATED PIPE OR EQUAL.
- 70 INSTALL 24" R.C.P., D PER PLAN.



CMP RISER DETAIL 5
N.T.S.



Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14348 FIRESTONE BLVD.
LA BREA, CALIFORNIA 90638
PH (714) 521-8111 FAX (714) 521-1173

BASIS OF BEARING:
THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF TIPPECANOE AVENUE BEING N 00°27'11" E AS PER RECORD OF SURVEY 97-0077, R.S.B. 113 / 15-22, IN THE CITY OF SAN BERNARDINO, RECORDS OF COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.

PLANS PREPARED UNDER THE SUPERVISION OF:
HAIDOOK AGHAIAN
R.C.E. NO. 43293

OWNER:
HILLWOOD INVESTMENTS
275 SOUTH MEMORIAL DRIVE
SAN BERNARDINO, CA 92408
TEL: (909) 382-0033
FAX: (909) 382-0073

BENCH MARK:
CITY OF SAN BERNARDINO DESIGNATION: B1-7 USC & GS DESIGNATION: H-524 RESET 1962 IN THE CITY OF SAN BERNARDINO, 43.0 FEET NORTH & 43.0 FEET EAST OF THE CENTERLINE INTERSECTION OF WATERMAN AVENUE & NORMAN ROAD AT NORTH END OF NORTHEAST CURB RETURN: 3" BRASS DISK STAMPED "US COAST & GEODETIC SURVEY BENCH MARK H524 RESET 1962" ELEVATION = 1011.231' (NGVD '29 / 1972 ADJ.)

APPROVED	MARK LANCASTER	20
CITY OF SAN BERNARDINO	REGISTERED CIVIL ENGINEER NO.	48048
DRAWN BY:		
CHECKED BY:		
RECOMMENDED BY:		

DP 11-05-05 E0500373

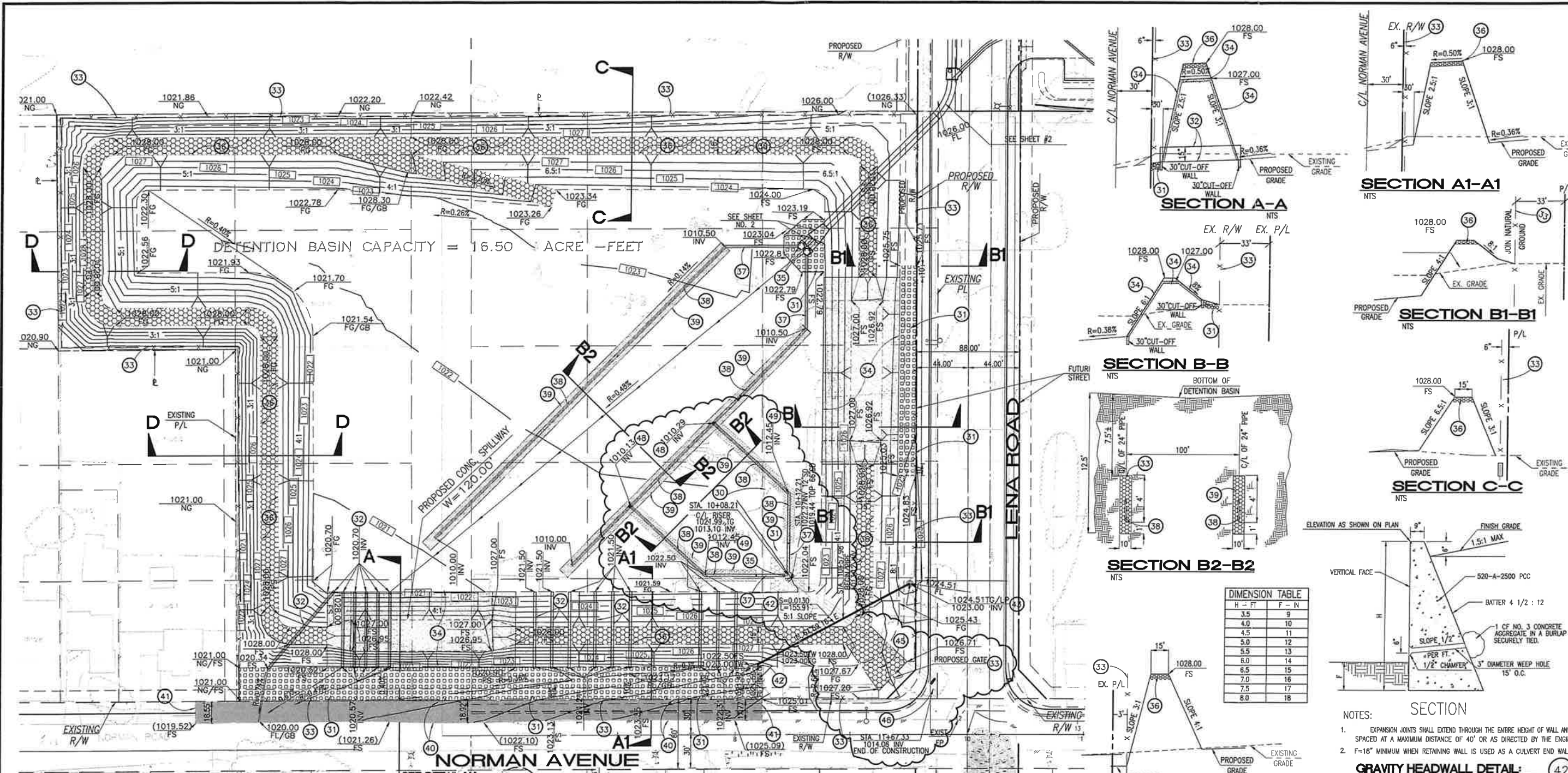
CITY OF SAN BERNARDINO
DEVELOPMENT SERVICES & PUBLIC WORKS/ENGINEERING

DETAILS AND CROSS SECTIONS

SAN BERNARDINO, CALIFORNIA

DRAWING NO. **11543**
SHEET **9** OF **9**

FOR CITY USE ONLY: FILE NO. CL NO. W.O. NO.



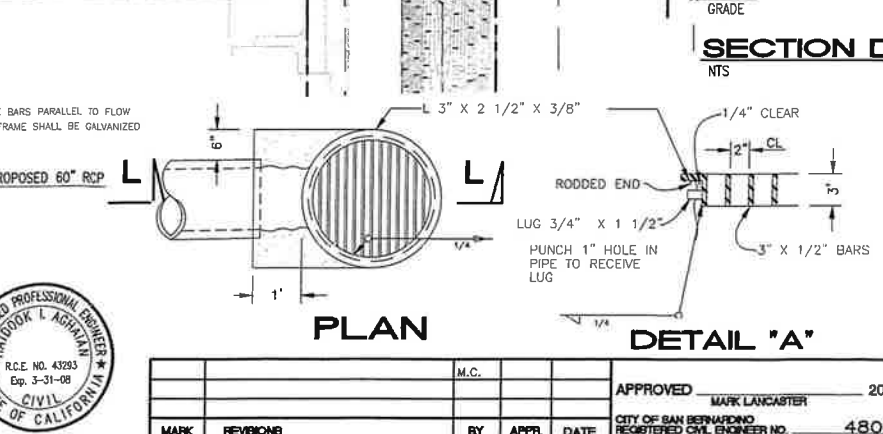
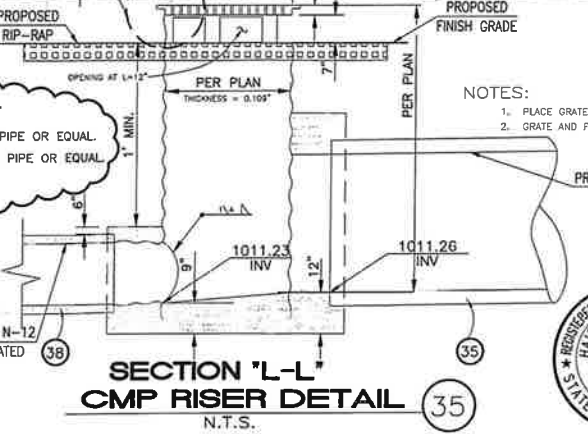
- DETONATION BASIN CONSTRUCTION NOTES**
- 30 REMOVE EXISTING CHAIN LINK FENCE.
 - 31 INSTALL 24" THICK 200 LB GROUTED RIP-RAP PER CAL TRANS SPECIFICATIONS.
 - 32 INSTALL 15" H.D.P.E. N-12 PIPE OR EQUAL.
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 - 39 INSTALL 5" DEEP AND 10' WIDE 3/4" GRAVEL PER SECTION "B2-B2".
 - 40 INSTALL 4" AC PAVEMENT OVER 90% COMPACTED NATIVE SOIL.
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 - 42 INSTALL GRAVITY HEADWALL PER DETAIL ON THIS SHEET.
 - 43 INSTALL 12" ROUND H.D.P.E. N-12 AREA DRAIN.
 - 44 INSTALL 12" H.D.P.E. N-12 PIPE OR EQUAL.
 - 45 CONSTRUCT 66" R.C.P., D PER PLAN.
 - 46 SEAL END PIPE PER DETAIL ON SHEET NO. 3.

47 CONSTRUCT JUNCTION STRUCTURE PER A.P.W.A. STD. PLAN NO. 331-2.

48 INSTALL 24" TEE H.D.P.E. N-12 PERFORATED PIPE OR EQUAL.

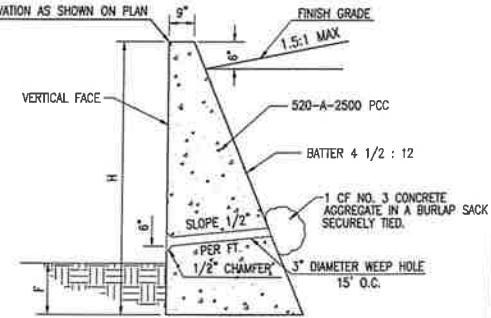
49 INSTALL 45" BEND H.D.P.E. N-12 PERFORATED PIPE OR EQUAL.

50 INSTALL 24" R.C.P., D PER PLAN.



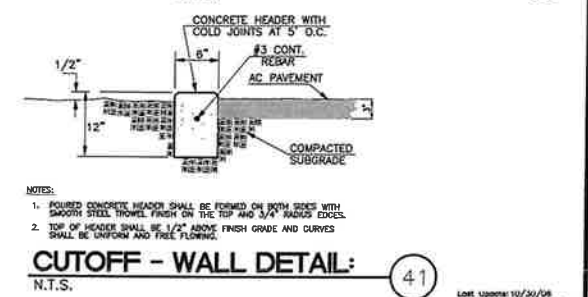
DIMENSION TABLE

H - FT	F - IN
3.5	9
4.0	10
4.5	11
5.0	12
5.5	13
6.0	14
6.5	15
7.0	16
7.5	17
8.0	18



NOTES:

- EXPANSION JOINTS SHALL EXTEND THROUGH THE ENTIRE HEIGHT OF WALL AND BE SPACED AT A MAXIMUM DISTANCE OF 40' OR AS DIRECTED BY THE ENGINEER.
- F=18" MINIMUM WHEN RETAINING WALL IS USED AS A CULVERT END WALL.



Thienes Engineering, Inc.
 CIVIL ENGINEERING • LAND SURVEYING
 14349 FIRESTONE BLVD.
 LA MIRADA, CALIFORNIA 90638
 PH: (714) 211-4811 FAX: (714) 551-4173

BASIS OF BEARING:
 THE BEARINGS SHOWN HEREON ARE BASED ON THE CENTERLINE OF TIPPECANOE AVENUE BEING N 02°27'11" E AS PER RECORD OF SURVEY 97-0077, R.S.B. 113 / 15-22, IN THE CITY OF SAN BERNARDINO, RECORDS OF COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.

PLANS PREPARED UNDER THE SUPERVISION OF:
 HAIDOOK AGHAJAN R.C.E. NO. 43293 DATE _____

OWNER:
 HILLWOOD INVESTMENTS
 275 SOUTH MEMORIAL DRIVE 92408
 SAN BERNARDINO, CA
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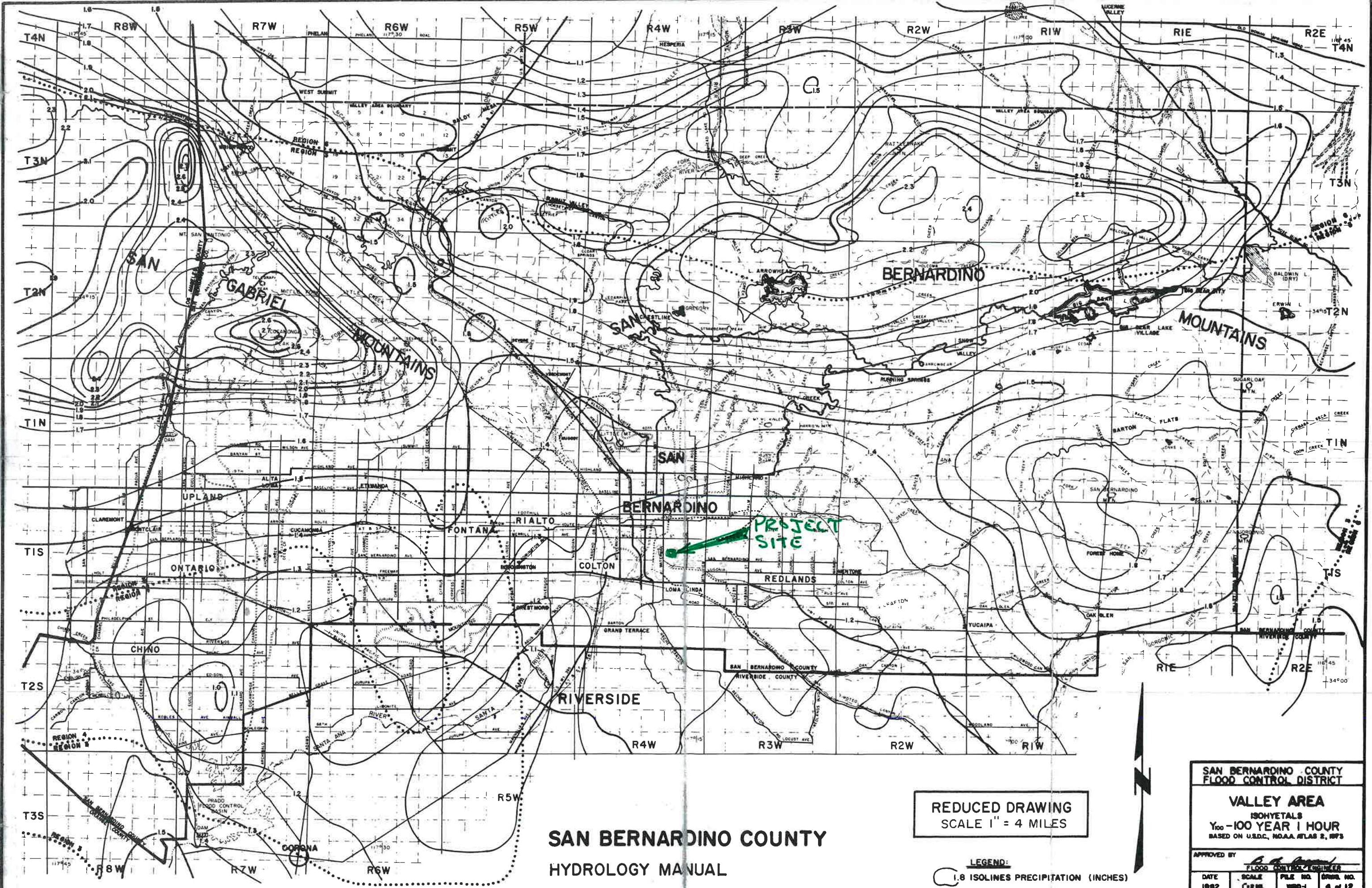
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APPROVED: MARK LANCASTER 20
 CITY OF SAN BERNARDINO REGISTERED CIVIL ENGINEER NO. 48048
 DRAWN BY:
 RECOMMENDED BY:

CITY OF SAN BERNARDINO
 DEVELOPMENT SERVICES & PUBLIC WORKS/ENGINEERING

DETENTION BASIN PLAN
 LENA ROAD
 SAN BERNARDINO, CALIFORNIA

DRAWING NO. **11543**
 SHEET **8** OF **9**



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

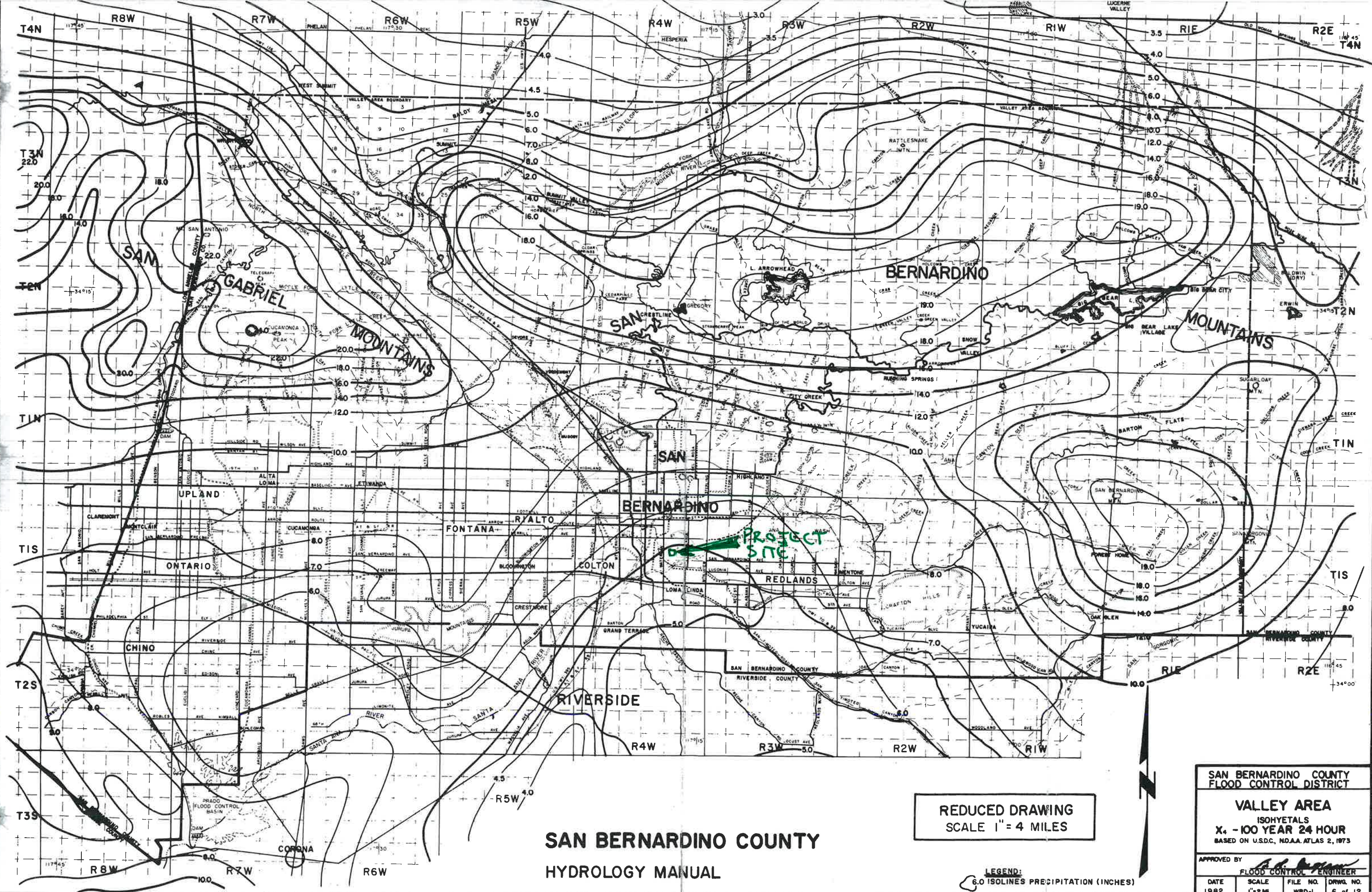
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT**

**VALLEY AREA
ISOHYETALS
Y100 - 100 YEAR 1 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973**

APPROVED BY: *[Signature]*
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 4 MI.	WB-1	4 of 12



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

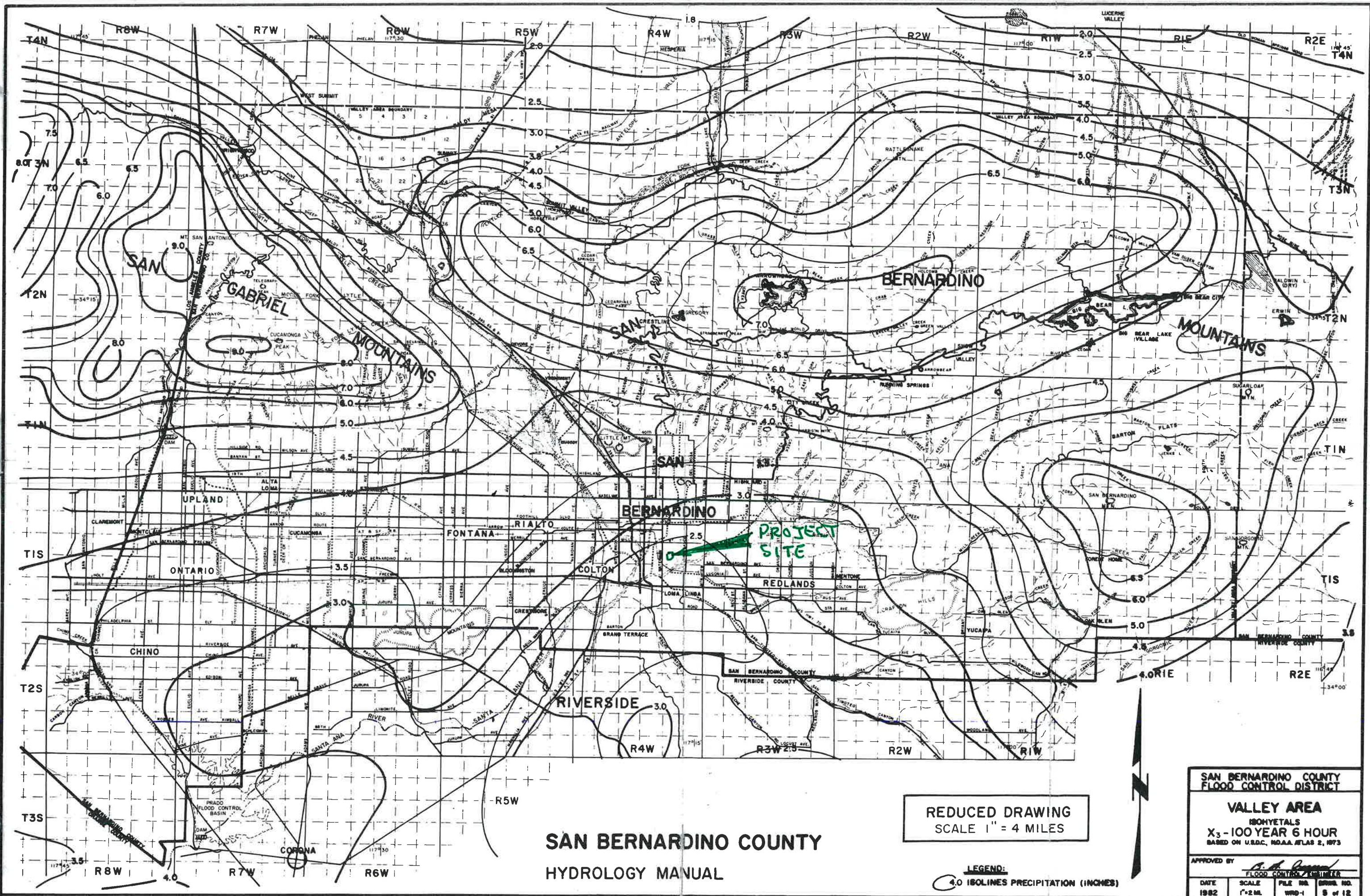
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT**

**VALLEY AREA
ISOHYETALS
X₄ - 100 YEAR 24 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973**

APPROVED BY *[Signature]*
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 2 MI.	WRD-1	6 OF 12



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

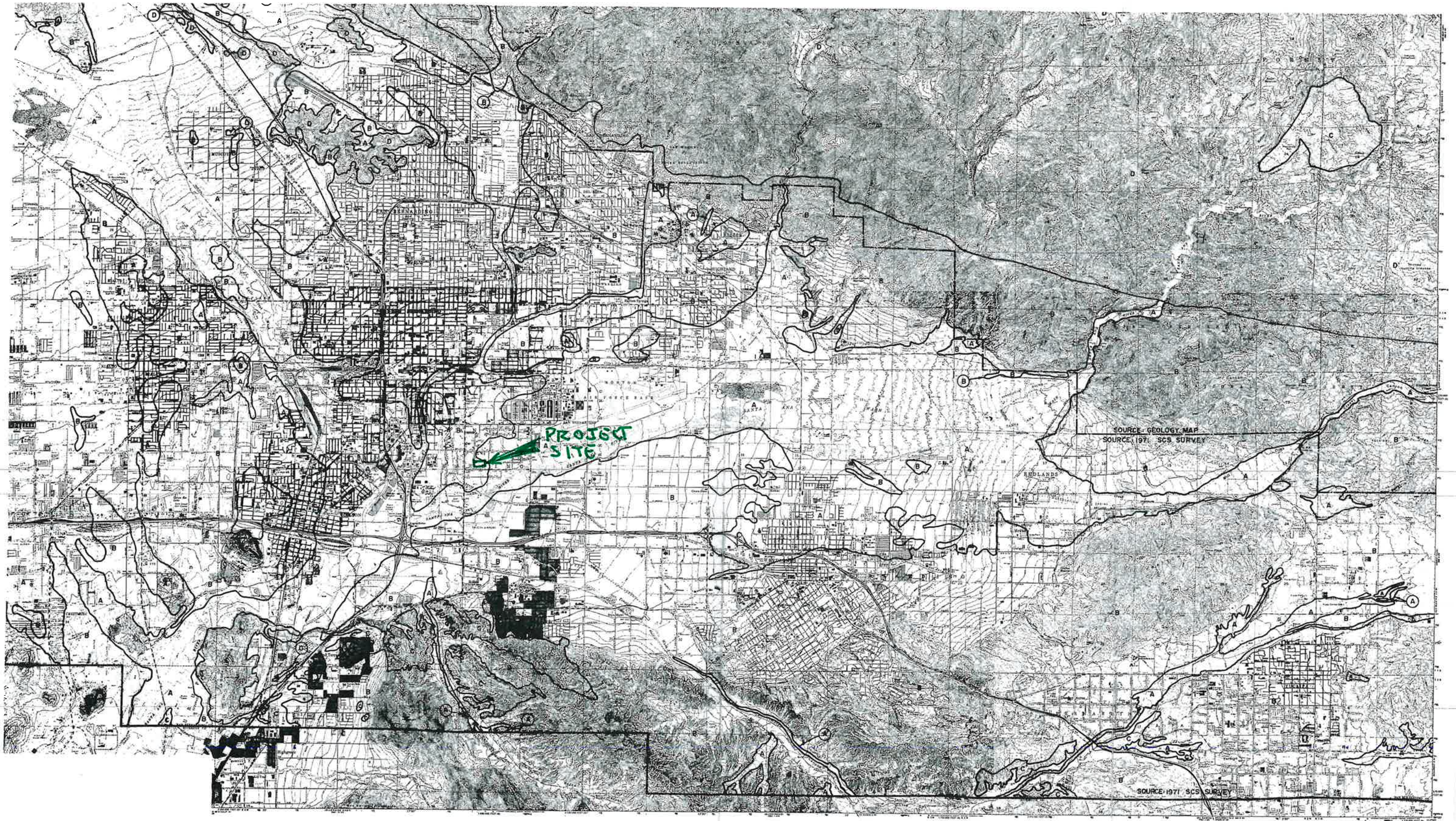
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT**

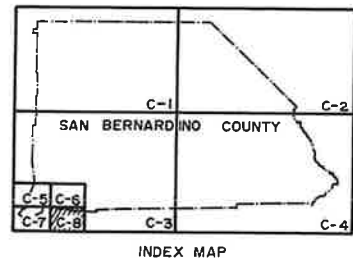
**VALLEY AREA
ISOHYETALS
X₃ - 100 YEAR 6 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973**

APPROVED BY *[Signature]*
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2 MI.	WRD-1	8 of 12



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL



- LEGEND
- SOIL GROUP BOUNDARY
 - A SOIL GROUP DESIGNATION
 - BOUNDARY OF INDICATED SOURCE

SCALE REDUCED BY 1/2

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-D AREA

APPENDIX B

HYDROLOGY CALCULATIONS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
(c) Copyright 1983-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 3575 *
* PROPOSED CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\3575\P100.DAT
TIME/DATE OF STUDY: 09:48 03/24/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2700

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 296.00
ELEVATION DATA: UPSTREAM(FEET) = 1022.99 DOWNSTREAM(FEET) = 1016.20

$T_c = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.299
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.911
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.50	0.42	0.100	76	6.30

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 2.19
TOTAL AREA(ACRES) = 0.50 PEAK FLOW RATE(CFS) = 2.19

FLOW PROCESS FROM NODE 101.00 TO NODE 123.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1012.51 DOWNSTREAM(FEET) = 1010.75
FLOW LENGTH(FEET) = 352.00 MANNING'S N = 0.012

DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.78
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 2.19
PIPE TRAVEL TIME(MIN.) = 1.55 Tc(MIN.) = 7.85
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 123.00 = 648.00 FEET.

FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 10

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

FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 188.00
ELEVATION DATA: UPSTREAM(FEET) = 1023.00 DOWNSTREAM(FEET) = 1017.45

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.000
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.640
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL B 0.35 0.42 0.100 76 5.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 1.76
TOTAL AREA(ACRES) = 0.35 PEAK FLOW RATE(CFS) = 1.76

FLOW PROCESS FROM NODE 111.00 TO NODE 122.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1015.00 DOWNSTREAM(FEET) = 1013.61
FLOW LENGTH(FEET) = 93.00 MANNING'S N = 0.012
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 5.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.48
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 1.76
PIPE TRAVEL TIME(MIN.) = 0.28 Tc(MIN.) = 5.28
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 122.00 = 281.00 FEET.

FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 5.28
RAINFALL INTENSITY(INCH/HR) = 5.46
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 0.35
TOTAL STREAM AREA(ACRES) = 0.35
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.76

FLOW PROCESS FROM NODE 120.00 TO NODE 121.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 274.00
ELEVATION DATA: UPSTREAM(FEET) = 1021.18 DOWNSTREAM(FEET) = 1015.86

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.315
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.903
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
 LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
 COMMERCIAL B 0.55 0.42 0.100 76 6.31
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
 SUBAREA RUNOFF(CFS) = 2.41
 TOTAL AREA(ACRES) = 0.55 PEAK FLOW RATE(CFS) = 2.41

 FLOW PROCESS FROM NODE 121.00 TO NODE 122.00 IS CODE = 31

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

 ELEVATION DATA: UPSTREAM(FEET) = 1014.05 DOWNSTREAM(FEET) = 1013.61
 FLOW LENGTH(FEET) = 88.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 3.83
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 2.41
 PIPE TRAVEL TIME(MIN.) = 0.38 Tc(MIN.) = 6.70
 LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 362.00 FEET.

 FLOW PROCESS FROM NODE 122.00 TO NODE 122.00 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.) = 6.70
 RAINFALL INTENSITY(INCH/HR) = 4.73
 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 0.55
 TOTAL STREAM AREA(ACRES) = 0.55
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.41

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	1.76	5.28	5.457	0.42(0.04)	0.10	0.3	110.00
2	2.41	6.70	4.733	0.42(0.04)	0.10	0.6	120.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.95	5.28	5.457	0.42(0.04)	0.10	0.8	110.00
2	3.93	6.70	4.733	0.42(0.04)	0.10	0.9	120.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 3.95 Tc(MIN.) = 5.28
 EFFECTIVE AREA(ACRES) = 0.78 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 0.9
 LONGEST FLOWPATH FROM NODE 120.00 TO NODE 122.00 = 362.00 FEET.

 FLOW PROCESS FROM NODE 122.00 TO NODE 123.00 IS CODE = 31

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

 ELEVATION DATA: UPSTREAM(FEET) = 1013.61 DOWNSTREAM(FEET) = 1010.75
 FLOW LENGTH(FEET) = 125.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.83
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 3.95
 PIPE TRAVEL TIME(MIN.) = 0.27 Tc(MIN.) = 5.55
 LONGEST FLOWPATH FROM NODE 120.00 TO NODE 123.00 = 487.00 FEET.

 FLOW PROCESS FROM NODE 123.00 TO NODE 123.00 IS CODE = 11

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

** MAIN STREAM CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	3.95	5.55	5.298	0.42(0.04)	0.10	0.8	110.00
2	3.93	6.96	4.624	0.42(0.04)	0.10	0.9	120.00

LONGEST FLOWPATH FROM NODE 120.00 TO NODE 123.00 = 487.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	2.19	7.85	4.303	0.42(0.04)	0.10	0.5	100.00

LONGEST FLOWPATH FROM NODE 100.00 TO NODE 123.00 = 648.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.86	5.55	5.298	0.42(0.04)	0.10	1.1	110.00
2	6.02	6.96	4.624	0.42(0.04)	0.10	1.3	120.00
3	5.85	7.85	4.303	0.42(0.04)	0.10	1.4	100.00

TOTAL AREA(ACRES) = 1.4

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 6.02 Tc(MIN.) = 6.964
EFFECTIVE AREA(ACRES) = 1.34 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 1.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 123.00 = 648.00 FEET.

FLOW PROCESS FROM NODE 123.00 TO NODE 134.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1010.75 DOWNSTREAM(FEET) = 1009.79
FLOW LENGTH(FEET) = 193.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.8 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.88
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 6.02
PIPE TRAVEL TIME(MIN.) = 0.66 Tc(MIN.) = 7.62
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 134.00 = 841.00 FEET.

FLOW PROCESS FROM NODE 134.00 TO NODE 134.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.62
RAINFALL INTENSITY(INCH/HR) = 4.38
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.34
TOTAL STREAM AREA(ACRES) = 1.40
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.02

FLOW PROCESS FROM NODE 130.00 TO NODE 131.00 IS CODE = 21

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

INITIAL SUBAREA FLOW-LENGTH(FEET) = 250.00
ELEVATION DATA: UPSTREAM(FEET) = 1028.92 DOWNSTREAM(FEET) = 1023.52

$Tc = K * [(LENGTH ** 3.00) / (ELEVATION CHANGE)] ** 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.959
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.077

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	1.60	0.42	0.100	76	5.96

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 7.25
TOTAL AREA(ACRES) = 1.60 PEAK FLOW RATE(CFS) = 7.25

FLOW PROCESS FROM NODE 131.00 TO NODE 132.00 IS CODE = 91

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

UPSTREAM NODE ELEVATION(FEET) = 1023.52
DOWNSTREAM NODE ELEVATION(FEET) = 1021.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 378.00
"V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.170
PAVEMENT LIP(FEET) = 0.013 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 0.67
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.135
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 2.65 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 12.11
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 2.59
AVERAGE FLOW DEPTH(FEET) = 0.45 FLOOD WIDTH(FEET) = 29.76
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 2.43 Tc(MIN.) = 8.39
SUBAREA AREA(ACRES) = 2.65 SUBAREA RUNOFF(CFS) = 9.76
EFFECTIVE AREA(ACRES) = 4.25 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 4.2 PEAK FLOW RATE(CFS) = 15.65

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.48 FLOOD WIDTH(FEET) = 33.18
FLOW VELOCITY(FEET/SEC.) = 2.72 DEPTH*VELOCITY(FT*FT/SEC) = 1.32
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 132.00 = 628.00 FEET.

FLOW PROCESS FROM NODE 132.00 TO NODE 133.00 IS CODE = 91

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

UPSTREAM NODE ELEVATION(FEET) = 1021.00
DOWNSTREAM NODE ELEVATION(FEET) = 1019.70
CHANNEL LENGTH THRU SUBAREA(FEET) = 165.00
"V" GUTTER WIDTH(FEET) = 3.00 GUTTER HIKE(FEET) = 0.170
PAVEMENT LIP(FEET) = 0.013 MANNING'S N = .0150
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 0.67
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.892
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 3.25 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 21.28
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 3.09
AVERAGE FLOW DEPTH(FEET) = 0.52 FLOOD WIDTH(FEET) = 36.42
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 9.28
SUBAREA AREA(ACRES) = 3.25 SUBAREA RUNOFF(CFS) = 11.26
EFFECTIVE AREA(ACRES) = 7.50 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 7.5 PEAK FLOW RATE(CFS) = 25.99

END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.55 FLOOD WIDTH(FEET) = 39.47
FLOW VELOCITY(FEET/SEC.) = 3.23 DEPTH*VELOCITY(FT*FT/SEC) = 1.77
LONGEST FLOWPATH FROM NODE 130.00 TO NODE 133.00 = 793.00 FEET.

FLOW PROCESS FROM NODE 133.00 TO NODE 134.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1015.70 DOWNSTREAM(FEET) = 1009.79
FLOW LENGTH(FEET) = 25.00 MANNING'S N = 0.012

DEPTH OF FLOW IN 15.0 INCH PIPE IS 10.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 29.91
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 25.99
 PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 9.29
 LONGEST FLOWPATH FROM NODE 130.00 TO NODE 134.00 = 818.00 FEET.

 FLOW PROCESS FROM NODE 134.00 TO NODE 134.00 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.) = 9.29
 RAINFALL INTENSITY(INCH/HR) = 3.89
 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42
 AREA-AVERAGED Ap = 0.10
 EFFECTIVE STREAM AREA(ACRES) = 7.50
 TOTAL STREAM AREA(ACRES) = 7.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 25.99

** CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	5.86	6.21	4.952	0.42(0.04)	0.10	1.1	110.00
1	6.02	7.62	4.380	0.42(0.04)	0.10	1.3	120.00
1	5.85	8.51	4.099	0.42(0.04)	0.10	1.4	100.00
2	25.99	9.29	3.889	0.42(0.04)	0.10	7.5	130.00

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

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	28.04	6.21	4.952	0.42(0.04)	0.10	6.1	110.00
2	30.06	7.62	4.380	0.42(0.04)	0.10	7.5	120.00
3	30.95	8.51	4.099	0.42(0.04)	0.10	8.3	100.00
4	31.53	9.29	3.889	0.42(0.04)	0.10	8.9	130.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) = 31.53 Tc(MIN.) = 9.29
 EFFECTIVE AREA(ACRES) = 8.90 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 TOTAL AREA(ACRES) = 8.9
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 134.00 = 841.00 FEET.

 FLOW PROCESS FROM NODE 134.00 TO NODE 135.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1009.79 DOWNSTREAM(FEET) = 1009.61
 FLOW LENGTH(FEET) = 36.00 MANNING'S N = 0.012
 DEPTH OF FLOW IN 33.0 INCH PIPE IS 22.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) = 7.38
 ESTIMATED PIPE DIAMETER(INCH) = 33.00 NUMBER OF PIPES = 1
 PIPE-FLOW(CFS) = 31.53
 PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 9.37
 LONGEST FLOWPATH FROM NODE 100.00 TO NODE 135.00 = 877.00 FEET.

=====

END OF STUDY SUMMARY:
 TOTAL AREA(ACRES) = 8.9 TC(MIN.) = 9.37
 EFFECTIVE AREA(ACRES) = 8.90 AREA-AVERAGED Fm(INCH/HR) = 0.04
 AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
 PEAK FLOW RATE(CFS) = 31.53

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	28.04	6.30	4.912	0.42(0.04)	0.10	6.1	110.00
2	30.06	7.71	4.351	0.42(0.04)	0.10	7.5	120.00
3	30.95	8.59	4.075	0.42(0.04)	0.10	8.3	100.00
4	31.53	9.37	3.868	0.42(0.04)	0.10	8.9	130.00

=====

=====
END OF RATIONAL METHOD ANALYSIS

↑

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 3575 *
* PROPOSED CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\3575\P200.DAT
TIME/DATE OF STUDY: 11:31 03/09/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2700

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 22

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<

=====

USER SPECIFIED Tc(MIN.) = 5.000
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.640

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	B	0.80	0.42	0.100	76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 4.03
TOTAL AREA(ACRES) = 0.80 PEAK FLOW RATE(CFS) = 4.03

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.8 TC(MIN.) = 5.00
EFFECTIVE AREA(ACRES) = 0.80 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 4.03

END OF RATIONAL METHOD ANALYSIS



RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 3575 *
* PROPOSED CONDITION *
* 100-YEAR STORM EVENT *

FILE NAME: W:\3575\P210.DAT
TIME/DATE OF STUDY: 11:32 03/09/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2700

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

NO.	HALF-WIDTH (FT)	CROWN CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 210.00 TO NODE 211.00 IS CODE = 22

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<

=====

USER SPECIFIED Tc(MIN.) = 5.000
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.640

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	B	0.90	0.42	0.100	76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 4.53
TOTAL AREA(ACRES) = 0.90 PEAK FLOW RATE(CFS) = 4.53

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES)	=	0.9	TC(MIN.)	=	5.00
EFFECTIVE AREA(ACRES)	=	0.90	AREA-AVERAGED Fm(INCH/HR)	=	0.04
AREA-AVERAGED Fp(INCH/HR)	=	0.42	AREA-AVERAGED Ap	=	0.100
PEAK FLOW RATE(CFS)	=	4.53			

END OF RATIONAL METHOD ANALYSIS



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Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 3575 *
* PROPOSED CONDITION *
* 100-YEAR STORM EVENT *

FILE NAME: W:\3575\P220.DAT
TIME/DATE OF STUDY: 11:33 03/09/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2700

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

NO.	HALF-WIDTH (FT)	CROWN CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 220.00 TO NODE 221.00 IS CODE = 22

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>>>USE SPECIFIED Tc VALUE FOR INITIAL SUBAREA<<<

=====

USER SPECIFIED Tc(MIN.) = 5.000
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 5.640

SUBAREA LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN
COMMERCIAL	B	0.70	0.42	0.100	76

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 3.53
TOTAL AREA(ACRES) = 0.70 PEAK FLOW RATE(CFS) = 3.53

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.7 TC(MIN.) = 5.00
EFFECTIVE AREA(ACRES) = 0.70 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 3.53

END OF RATIONAL METHOD ANALYSIS



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Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 3575 *
* FOISY STREET RUNOFF *
* 100-YEAR STORM EVENT *

FILE NAME: W:\3575\VP300.DAT
TIME/DATE OF STUDY: 16:33 03/24/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2700

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 300.00 TO NODE 301.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 408.00
ELEVATION DATA: UPSTREAM(FEET) = 1018.18 DOWNSTREAM(FEET) = 1017.45

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 11.929
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.348
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	0.20	0.42	0.100	76	11.93

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 0.59
TOTAL AREA(ACRES) = 0.20 PEAK FLOW RATE(CFS) = 0.59

=====

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 11.93
EFFECTIVE AREA(ACRES) = 0.20 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 0.59

=====

END OF RATIONAL METHOD ANALYSIS

APPENDIX C

HYDRAULIC CALCULATIONS

DATE: 3/25/2022
 TIME: 8:42

F0515P
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT	1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIERS	WIDTH	DIAMETER	WIDTH				DROP										
CD	24	4			2.00															
CD	18	4			1.50															
CD	30	4			2.50															

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB 3575

HEADING LINE NO 2 IS -

LINE A

HEADING LINE NO 3 IS -

100-YEAR STORM

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS A	DESCRIPTION	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS A	SYSTEM OUTLET	1004.52	1000.48	30	1013.16				
2	IS A	REACH	1035.85	1011.44	30		0.00	0.00	0.00	0
3	IS A	JUNCTION	1040.18	1011.54	24					
4	IS A	REACH	1057.85	1014.21	24		22.50	45.00	0.00	0
5	IS A	REACH	1064.39	1015.20	24		0.00	0.00	0.00	0
6	IS A	SYSTEM HEADWORKS	1064.39	1015.20	24	0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

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PAGE

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WATER SURFACE PROFILE LISTING

TEI JOB 3575
 LINE A
 100-YEAR STORM

STATION	INVERT	DEPTH	W.S.	Q	VEL	VEL	ENERGY	SUPER	CRITICAL	HGT/	BASE/	ZL	NO
AVBPR	ELEV	OF FLOW	ELEV			HEAD	GRD.EL.	ELEV	DEPTH	DIA	ID NO.		PIER
L/ELEM	SO					SF AVE	HF			NORM DEPTH		ZR	

1004.52 0.00	1000.48	12.680	1013.160	35.5	7.23	0.812	1013.972	0.00	2.022	2.50	0.00	0.00	0
27.40	0.34982					.007491	0.21			0.644		0.00	
1031.92 0.00	1010.06	3.304	1013.368	35.5	7.23	0.812	1014.180	0.00	2.022	2.50	0.00	0.00	0
HYDRAULIC JUMP												0.00	
1031.92 0.00	1010.06	1.197	1011.261	35.5	15.29	3.629	1014.890	0.00	2.022	2.50	0.00	0.00	0
0.02	0.34982					.034708	0.00			0.644		0.00	
1031.94 0.00	1010.07	1.197	1011.269	35.5	15.28	3.623	1014.892	0.00	2.022	2.50	0.00	0.00	0
0.89	0.34982					.032588	0.03			0.644		0.00	
1032.83 0.00	1010.38	1.243	1011.628	35.5	14.57	3.295	1014.923	0.00	2.022	2.50	0.00	0.00	0
0.79	0.34982					.028697	0.02			0.644		0.00	
1033.62 0.00	1010.66	1.290	1011.950	35.5	13.89	2.995	1014.945	0.00	2.022	2.50	0.00	0.00	0
0.68	0.34982					.025284	0.02			0.644		0.00	
1034.30 0.00	1010.90	1.340	1012.239	35.5	13.24	2.723	1014.962	0.00	2.022	2.50	0.00	0.00	0
0.60	0.34982					.022305	0.01			0.644		0.00	
1034.90 0.00	1011.11	1.393	1012.500	35.5	12.62	2.475	1014.975	0.00	2.022	2.50	0.00	0.00	0
0.51	0.34982					.019695	0.01			0.644		0.00	
1035.41 0.00	1011.29	1.448	1012.735	35.5	12.04	2.250	1014.985	0.00	2.022	2.50	0.00	0.00	0
0.44	0.34982					.017411	0.01			0.644		0.00	
1035.85 0.00	1011.44	1.507	1012.947	35.5	11.48	2.046	1014.993	0.00	2.022	2.50	0.00	0.00	0
JUNCT STR												0.02310	
						.045024	0.19					0.00	
1040.18 0.00	1011.54	0.958	1012.498	26.0	17.50	4.754	1017.252	0.00	1.786	2.00	0.00	0.00	0
1.10	0.15110					.060338	0.07			0.742		0.00	

↑
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F0515P

PAGE

WATER SURFACE PROFILE LISTING

TEI JOB 3575
LINE A
100-YEAR STORM

STATION AVBPR	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER
------------------	----------------	------------------	--------------	---	-----	-------------	-------------------	---------------	-------------------	-------------	-----------------	----	------------

L/ELEM	SO			SF AVE	HF	NORM DEPTH			ZR				
1041.28 0.00	1011.71	0.966	1012.672	26.0	17.29	4.641	1017.313	0.00	1.786	2.00	0.00	0.00	0
4.04	0.15110					.055837	0.23			0.742		0.00	
1045.32 0.00	1012.32	1.003	1013.320	26.0	16.49	4.221	1017.541	0.00	1.786	2.00	0.00	0.00	0
3.39	0.15110					.049174	0.17			0.742		0.00	
1048.71 0.00	1012.83	1.041	1013.871	26.0	15.72	3.837	1017.708	0.00	1.786	2.00	0.00	0.00	0
2.87	0.15110					.043327	0.12			0.742		0.00	
1051.58 0.00	1013.26	1.081	1014.344	26.0	14.99	3.487	1017.831	0.00	1.786	2.00	0.00	0.00	0
2.43	0.15110					.038224	0.09			0.742		0.00	
1054.01 0.00	1013.63	1.124	1014.754	26.0	14.29	3.172	1017.926	0.00	1.786	2.00	0.00	0.00	0
2.07	0.15110					.033766	0.07			0.742		0.00	
1056.08 0.00	1013.94	1.169	1015.112	26.0	13.63	2.883	1017.995	0.00	1.786	2.00	0.00	0.00	0
1.77	0.15110					.029863	0.05			0.742		0.00	
1057.85 0.00	1014.21	1.217	1015.427	26.0	12.99	2.622	1018.049	0.00	1.786	2.00	0.00	0.00	0
0.34	0.15138					.027683	0.01			0.742		0.00	
1058.19 0.00	1014.26	1.227	1015.488	26.0	12.86	2.567	1018.055	0.00	1.786	2.00	0.00	0.00	0
1.45	0.15138					.025774	0.04			0.742		0.00	
1059.64 0.00	1014.48	1.278	1015.759	26.0	12.26	2.336	1018.095	0.00	1.786	2.00	0.00	0.00	0
1.23	0.15138					.022870	0.03			0.742		0.00	
1060.87 0.00	1014.67	1.332	1016.000	26.0	11.69	2.122	1018.122	0.00	1.786	2.00	0.00	0.00	0
1.03	0.15138					.020335	0.02			0.742		0.00	
1061.90 0.00	1014.82	1.390	1016.214	26.0	11.15	1.930	1018.144	0.00	1.786	2.00	0.00	0.00	0
0.85	0.15138					.018135	0.02			0.742		0.00	

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F0515P

PAGE

WATER SURFACE PROFILE LISTING

TEI JOB 3575
LINE A
100-YEAR STORM

STATION AVBPR	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER
------------------	----------------	------------------	--------------	---	-----	-------------	-------------------	---------------	-------------------	-------------	-----------------	----	------------

1049.70	.							I	W	C	H		E	.	R
1050.83	.												.		
1051.96	.							I	W	CH			E	.	R
1053.09	.												.		
1054.22	.							I	W	CH			E	.	R
1055.35	.												.		
1056.48	.							I	W	CH			E	.	R
1057.61	.												.		
1058.74	.							I		W	CH		E	.	R
1059.87	.							I		W	CH		E	.	R
1061.00	.								I		W	CH	E	.	R
1062.13	.								I		W	CH	E	.	R
1063.26	.								I		W	CH	E	.	R
1064.39	.								I		W	CH	E	.	R
	.												.		
		1000.48	1002.25	1004.02	1005.79	1007.56	1009.33	1011.10	1012.87	1014.64	1016.41	1018.18			

NOTES

1. GLOSSARY

- I = INVERT ELEVATION
- C = CRITICAL DEPTH
- W = WATER SURFACE ELEVATION
- H = HEIGHT OF CHANNEL
- E = ENERGY GRADE LINE
- X = CURVES CROSSING OVER
- B = BRIDGE ENTRANCE OR EXIT
- Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

ELEMENT NO 11 IS A SYSTEM HEADWORKS * *
 U/S DATA STATION INVERT SECT W S ELEV
 1329.24 1013.47 18 0.00

WATER SURFACE PROFILE - ELEMENT CARD LISTING
 NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC ^
 LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB 3575
 LINE B
 100-YEAR STORM

STATION AVBPR	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR	
1001.75 0.00	1011.69	1.173	1012.863	9.2	6.20	0.598	1013.461	0.00	1.173	1.50	0.00	0.00	0
	2.94	0.00488				.006830	0.02		1.500			0.00	
1004.69 0.00	1011.70	1.233	1012.937	9.2	5.92	0.544	1013.481	0.00	1.173	1.50	0.00	0.00	0
	15.23	0.00488				.006229	0.09		1.500			0.00	
1019.92 0.00	1011.78	1.303	1013.082	9.2	5.64	0.494	1013.576	0.00	1.173	1.50	0.00	0.00	0
	28.99	0.00488				.005837	0.17		1.500			0.00	
1048.91 0.00	1011.92	1.364	1013.284	9.2	5.45	0.461	1013.745	0.00	1.173	1.50	0.00	0.00	0
	21.67	0.00508				.005686	0.12		1.500			0.00	
1070.58 0.00	1012.03	1.388	1013.418	9.2	5.39	0.451	1013.869	0.00	1.173	1.50	0.00	0.00	0
	79.39	0.00499				.006027	0.48		1.500			0.00	
1149.97 0.00	1012.43	1.500	1013.926	9.2	5.21	0.421	1014.347	0.00	1.173	1.50	0.00	0.00	0
	40.75	0.00499				.006464	0.26		1.500			0.00	
1190.72 0.00	1012.63	1.563	1014.193	9.2	5.21	0.421	1014.614	0.00	1.173	1.50	0.00	0.00	0
JUNCT STR	0.00462					.005710	0.02					0.00	
1195.05 0.00	1012.65	2.170	1014.820	4.9	2.77	0.119	1014.939	0.00	0.851	1.50	0.00	0.00	0
	95.92	0.00302				.001854	0.18		1.000			0.00	
1290.97 0.00	1012.94	2.058	1014.998	4.9	2.77	0.119	1015.117	0.00	0.851	1.50	0.00	0.00	0
JUNCT STR	0.00000					.001591	0.00					0.00	

1249.04	.											.	
1255.72	.											.	
1262.41	.											.	
1269.09	.											.	
1275.77	.											.	
1282.46	.											.	
1289.14	.											.	
1295.82	.			I			C		H		W E	.	
1302.51	.			I			C		H		WE	.	
1309.19	.			I			C		H		WE	.	
1315.87	.											.	
1322.56	.				I			C		H		WE	.
1329.24	.					I			C		H	X	.
	.												.
		1011.69	1012.04	1012.40	1012.75	1013.11	1013.46	1013.81	1014.17	1014.52	1014.87	1015.23	

N O T E S

1. GLOSSARY

I = INVERT ELEVATION

C = CRITICAL DEPTH

W = WATER SURFACE ELEVATION

H = HEIGHT OF CHANNEL

E = ENERGY GRADE LINE

X = CURVES CROSSING OVER

B = BRIDGE ENTRANCE OR EXIT

Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

DATE: 3/25/2022
 TIME: 8:50

F0515P
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT	1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIERS	WIDTH	DIAMETER	WIDTH				DROP										
CD	12	4			1.00															

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NUMBER 3575

HEADING LINE NO 2 IS -

STORM DRAIN LATERAL B1

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV				
1					1000.75	1012.94	12	1015.18				
ELEMENT NO	IS	A	REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
2					1034.49	1013.04	12	0.012	0.00	0.00	0.00	0
3					1061.98	1013.12	12	0.012	22.50	45.00	0.00	0
4					1092.28	1013.21	12	0.012	0.00	0.00	0.00	0
ELEMENT NO	IS	A	SYSTEM HEADWORKS	U/S DATA	STATION	INVERT	SECT	W S ELEV				
5					1092.28	1013.21	12	0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: THIENES ENGINEERING

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WATER SURFACE PROFILE LISTING

TEI JOB NUMBER 3575
 STORM DRAIN LATERAL B1
 100-YEAR

STATION	INVERT	DEPTH	W.S.	Q	VEL	VEL	ENERGY	SUPER	CRITICAL	HGT/	BASE/	ZL	NO
AVBPR	ELEV	OF FLOW	ELEV		HEAD	GRD.EL.	ELEV	DEPTH		DIA	ID NO.	PIER	
L/ELEM	SO				SF AVE	HF		NORM DEPTH				ZR	
1000.75	1012.94	2.240	1015.180	2.4	3.06	0.145	1015.325	0.00	0.663	1.00	0.00	0.00	0
0.00													
33.74	0.00296				.003866	0.13		1.000				0.00	

1034.49 0.00	1013.04	2.270	1015.310	2.4	3.06	0.145	1015.455	0.00	0.663	1.00	0.00	0.00	0
27.49	0.00291					.003866	0.11		1.000			0.00	
1061.98 0.00	1013.12	2.317	1015.437	2.4	3.06	0.145	1015.582	0.00	0.663	1.00	0.00	0.00	0
30.30	0.00297					.003866	0.12		1.000			0.00	
1092.28 0.00	1013.21	2.344	1015.554	2.4	3.06	0.145	1015.699	0.00	0.663	1.00	0.00	0.00	0

TEI JOB NUMBER 3575
STORM DRAIN LATERAL B1
100-YEAR

1000.75	.	.	.	.	.	.	.	.	.	.	.	.	.
1002.62	.I			C		H							W E . R
1004.49	.												.
1006.35	.												.
1008.22	.												.
1010.09	.												.
1011.96	.												.
1013.83	.												.
1015.69	.												.
1017.56	.												.
1019.43	.												.
1021.30	.												.
1023.17	.												.
1025.03	.												.
1026.90	.												.
1028.77	.												.
1030.64	.												.
1032.51	.												.
1034.37	.												.
1036.24	. I			C		H							W E . R
1038.11	.												.
1039.98	.												.
1041.85	.												.
1043.71	.												.
1045.58	.												.
1047.45	.												.
1049.32	.												.
1051.18	.												.
1053.05	.												.
1054.92	.												.
1056.79	.												.
1058.66	.												.
1060.52	.												.
1062.39	. I			C		H							W E . R
1064.26	.												.
1066.13	.												.
1068.00	.												.
1069.86	.												.
1071.73	.												.
1073.60	.												.
1075.47	.												.
1077.34	.												.
1079.20	.												.
1081.07	.												.
1082.94	.												.
1084.81	.												.
1086.68	.												.
1088.54	.												.
1090.41	.												.
1092.28	. I			C		H							W E . R
	.												.
		1012.94	1013.22	1013.49	1013.77	1014.04	1014.32	1014.60	1014.87	1015.15	1015.42	1015.70	

N O T E S
1. GLOSSARY
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2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

DATE: 3/25/2022
 TIME: 8:52

F0515P
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT	1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIERS	WIDTH	DIAMETER	WIDTH				DROP										

CD 12 4 1.00

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NUMBER 3575

HEADING LINE NO 2 IS -

STORM DRAIN LATERAL C1

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1 IS A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV
				1001.75	1013.98	12	1015.28

ELEMENT NO	2 IS A	REACH	U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
				1018.46	1014.04	12	0.012	0.00	0.00	0.00	0

ELEMENT NO	3 IS A	SYSTEM HEADWORKS	U/S DATA	STATION	INVERT	SECT	W S ELEV
				1018.46	1014.01	12	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: THIENES ENGINEERING

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PAGE

1

WATER SURFACE PROFILE LISTING

TEI JOB NUMBER 3575
 STORM DRAIN LATERAL C1
 100-YEAR

STATION	INVERT	DEPTH	W.S.	Q	VEL	VEL	ENERGY	SUPER	CRITICAL	HGT/	BASE/	ZL	NO
AVBPR	ELEV	OF FLOW	ELEV		HEAD	GRD.EL.	ELEV	DEPTH		DIA	ID NO.	PIER	
L/ELEM	SO				SF AVE	HF		NORM DEPTH				ZR	

1001.75	1013.98	1.300	1015.280	2.2	2.80	0.122	1015.402	0.00	0.634	1.00	0.00	0.00	0
0.00													
16.71	0.00359				.003249	0.05			0.770			0.00	
1018.46	1014.04	1.294	1015.334	2.2	2.80	0.122	1015.456	0.00	0.634	1.00	0.00	0.00	0
0.00													

** WARNING NO. 22 ** - NO PLOT GENERATED, BAD DATA OR NOT ENOUGH POINTS, 3 OR LESS

PUBA

DATE: 1/13/2022
TIME: 8:35

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT 1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIERS	WIDTH	DIAMETER	WIDTH			DROP										
CD	54	4			4.50														
CD	48	4			4.00														
CD	24	4			2.00														

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB 3575

HEADING LINE NO 2 IS -

PUBLIC STORM DRAIN

HEADING LINE NO 3 IS -

100-YEAR STORM

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1			U/S DATA	1000.00	995.93	54	999.00				
2			U/S DATA	1019.34	995.97	54		0.00	0.00	0.00	0
3			U/S DATA	1042.46	996.01	54		45.00	30.00	0.00	0
4			U/S DATA	1137.05	996.20	54		0.00	0.00	0.00	0
5			U/S DATA	1160.61	996.25	54		45.00	30.00	0.00	0
6			U/S DATA	1182.49	996.29	54		0.00	0.00	0.00	0
7			U/S DATA	1205.72	996.34	54		0.00	0.00	0.00	0
8			U/S DATA	1995.30	997.92	54		0.00	0.00	0.00	3
9			U/S DATA	2030.64	997.99	54		22.50	90.00	0.00	0
10			U/S DATA								

PUBA

	2466.43	998.86	54		0.013					0.00	0.00	0.00	0
ELEMENT NO	11 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN H
		2537.12	999.02	54		0.013				45.00	90.00	0.00	0
ELEMENT NO	12 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN H
		2651.63	999.02	54		0.012				0.00	0.00	0.00	0
ELEMENT NO	13 IS A JUNCTION	*	*	*	*	*	*	*	*	*	*	*	*
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		2651.63	999.23	54	24	0	0.014	31.7	0.0	1000.48	0.00	45.00	0.00
					F 0 5 1 5 P								PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	14 IS A REACH	*	*	*									
	U/S DATA	STATION	INVERT	SECT		N				RADIUS	ANGLE	ANG PT	MAN H
		3199.19	1000.33	54		0.013				0.00	0.00	0.00	2
ELEMENT NO	15 IS A SYSTEM HEADWORKS	*		*				*					
	U/S DATA	STATION	INVERT	SECT					W S ELEV				
		3199.19	1000.33	54					0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

LICENSEE: THIENES ENGINEERING

F0515P

PAGE

1

WATER SURFACE PROFILE LISTING

TEI JOB 3575
PUBLIC STORM DRAIN
100-YEAR STORM

STATION AVBPR	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL PIER	NO
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR	
1000.00 0.00	995.93	3.735	999.665	163.5	11.59	2.085	1001.750	0.00	3.735	4.50	0.00	0.00	0
	6.23	0.00207				.006498	0.04		4.500			0.00	
1006.23 0.00	995.94	3.952	999.895	163.5	11.05	1.895	1001.790	0.00	3.735	4.50	0.00	0.00	0
	13.11	0.00207				.006127	0.08		4.500			0.00	
1019.34 0.00	995.97	4.114	1000.084	163.5	10.73	1.786	1001.870	0.00	3.735	4.50	0.00	0.00	0
	23.12	0.00173				.006016	0.14		4.500			0.00	
1042.46 0.00	996.01	4.310	1000.320	163.5	10.43	1.690	1002.010	0.00	3.735	4.50	0.00	0.00	0
	32.05	0.00201				.006419	0.21		4.500			0.00	
1074.51 0.00	996.07	4.500	1000.574	163.5	10.28	1.641	1002.215	0.00	3.735	4.50	0.00	0.00	0
	62.54	0.00201				.006869	0.43		4.500			0.00	
1137.05 0.00	996.20	4.807	1001.007	163.5	10.28	1.641	1002.648	0.00	3.735	4.50	0.00	0.00	0
	23.56	0.00212				.006913	0.16		4.500			0.00	

PUBA

1160.61 0.00	996.25	5.109	1001.359	163.5	10.28	1.641	1003.000	0.00	3.735	4.50	0.00	0.00	0
21.88	0.00183					.006913	0.15			4.500		0.00	
1182.49 0.00	996.29	5.220	1001.510	163.5	10.28	1.641	1003.151	0.00	3.735	4.50	0.00	0.00	0
23.23	0.00215					.006913	0.16			4.500		0.00	
1205.72 0.00	996.34	5.331	1001.671	163.5	10.28	1.641	1003.312	0.00	3.735	4.50	0.00	0.00	0
789.58	0.00200					.006913	5.46			4.500		0.00	
1995.30 0.00	997.92	9.455	1007.375	163.5	10.28	1.641	1009.016	0.00	3.735	4.50	0.00	0.00	0
35.34	0.00198					.006913	0.24			4.500		0.00	
2030.64 0.00	997.99	9.958	1007.948	163.5	10.28	1.641	1009.589	0.00	3.735	4.50	0.00	0.00	0
435.79	0.00200					.006913	3.01			4.500		0.00	

↑
LICENSEE: THIENES ENGINEERING
2

F0515P

PAGE

WATER SURFACE PROFILE LISTING

TEI JOB 3575
PUBLIC STORM DRAIN
100-YEAR STORM

STATION AVBPR	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD. EL.	SUPER ELEV	CRITICAL DEPTH	HGT/ DIA	BASE/ ID NO.	ZL	NO PIER
L/ELEM	SO					SF AVE	HF		NORM DEPTH			ZR	
2466.43 0.00	998.86	12.100	1010.960	163.5	10.28	1.641	1012.601	0.00	3.735	4.50	0.00	0.00	0
70.69	0.00226					.006913	0.49			4.500		0.00	
2537.12 0.00	999.02	12.757	1011.777	163.5	10.28	1.641	1013.418	0.00	3.735	4.50	0.00	0.00	0
114.51	0.00000					.005890	0.67			0.000		0.00	
2651.63 0.00	999.02	13.432	1012.452	163.5	10.28	1.641	1014.093	0.00	3.735	4.50	0.00	0.00	0
JUNCT STR	0.00000					.006613	0.00					0.00	
2651.63 0.00	999.23	13.929	1013.159	131.8	8.29	1.066	1014.225	0.00	3.379	4.50	0.00	0.00	0
547.56	0.00201					.004492	2.46			4.500		0.00	
3199.19 0.00	1000.33	15.396	1015.726	131.8	8.29	1.066	1016.792	0.00	3.379	4.50	0.00	0.00	0

TEI JOB 3575
PUBLIC STORM DRAIN
100-YEAR STORM

PUBA

1000.00	.I		X	H	E																	R	
1044.88	.I		C	W	H	E																R	
1089.76	.I		C	W	H	E																R	
1134.64	.I		C	X		E																R	
1179.53	.I		C	X		E																R	
1224.41	.I		C	H	W		E															R	
1269.29	.I		C	H	W		E															R	
1314.17	.I		C	H	W		E															R	
1359.05	.I		C	H	W		E															R	
1403.93	.																						
1448.81	.																						
1493.70	.																						
1538.58	.																						
1583.46	.																						
1628.34	.																						
1673.22	.																						
1718.10	.																						
1762.98	.																						
1807.87	.																						
1852.75	.																						
1897.63	.																						
1942.51	.																						
1987.39	.																						
2032.27	.	I			C	H			W		E											R	
2077.15	.	I			C	H			W		E											R	
2122.04	.																						
2166.92	.																						
2211.80	.																						
2256.68	.																						
2301.56	.																						
2346.44	.																						
2391.32	.																						
2436.21	.																						
2481.09	.		I			C	H			W		E										R	
2525.97	.																						
2570.85	.		I			C	H			W		E										R	
2615.73	.																						
2660.61	.		I			C	H				W		E									JX	
2705.49	.		I			C	H				W		E									R	
2750.38	.																						
2795.26	.																						
2840.14	.																						
2885.02	.																						
2929.90	.																						
2974.78	.																						
3019.66	.																						
3064.55	.																						
3109.43	.																						
3154.31	.																						
3199.19	.			I			C	H						W		E						R	
		995.93	998.02	1000.10	1002.19	1004.27	1006.36	1008.45	1010.53	1012.62	1014.71	1016.79											

NOTES

1. GLOSSARY

- I = INVERT ELEVATION
- C = CRITICAL DEPTH
- W = WATER SURFACE ELEVATION
- H = HEIGHT OF CHANNEL
- E = ENERGY GRADE LINE
- X = CURVES CROSSING OVER
- B = BRIDGE ENTRANCE OR EXIT
- Y = WALL ENTRANCE OR EXIT

2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

ONSITE

2.79	0.02000					.013933	0.04			0.260		0.00	
1008.76	1023.97	0.299	1024.264	4.0	4.46	0.309	1024.573	0.00	0.330		0.33	3.00	0.00 0
0.00													
1.68	0.02000					.012013	0.02			0.260		0.00	
1010.44	1024.00	0.314	1024.313	4.0	4.25	0.281	1024.594	0.00	0.330		0.33	3.00	0.00 0
0.00													
1.06	0.02000					.010317	0.01			0.260		0.00	
1011.50	1024.02	0.330	1024.350	4.0	4.04	0.253	1024.603	0.00	0.330		0.33	3.00	0.00 0
0.00													

TEI JOB NUMBER 3575
 PARKWAY CULVERT 1
 100-YEAR

1000.00	.	.	.	.	.	.	.	.	.	.	.	.	.
1000.23	.I	.	.	W	X	.	.	.	.	E	.	.	R
1000.47	.	.	.	.	.	.	.	.	.	.	.	.	.
1000.70	.I	.	.	W	X	.	.	.	.	E	.	.	R
1000.94	.	.	.	.	.	.	.	.	.	.	.	.	.
1001.17	.	.	.	.	.	.	.	.	.	.	.	.	.
1001.41	.	.	.	.	.	.	.	.	.	.	.	.	.
1001.64	.	.	.	.	.	.	.	.	.	.	.	.	.
1001.88	.	.	.	.	.	.	.	.	.	.	.	.	.
1002.11	.	.	.	.	.	.	.	.	.	.	.	.	.
1002.35	.	.	.	.	.	.	.	.	.	.	.	.	.
1002.58	.	.	.	.	.	.	.	.	.	.	.	.	.
1002.82	.	.	.	.	.	.	.	.	.	.	.	.	.
1003.05	.	.	.	.	.	.	.	.	.	.	.	.	.
1003.29	.	.	.	.	.	.	.	.	.	.	.	.	.
1003.52	.	.	.	.	.	.	.	.	.	.	.	.	.
1003.76	.	.	.	.	.	.	.	.	.	.	.	.	.
1003.99	.	.	.	.	.	.	.	.	.	.	.	.	.
1004.22	.	.	.	.	.	.	.	.	.	.	.	.	.
1004.46	.	.	.	.	.	.	.	.	.	.	.	.	.
1004.69	.	.	.	.	.	.	.	.	.	.	.	.	.
1004.93	.	.	.	.	.	.	.	.	.	.	.	.	.
1005.16	.	.	.	.	.	.	.	.	.	.	.	.	.
1005.40	.	.	.	.	.	.	.	.	.	.	.	.	.
1005.63	.	.	.	.	.	.	.	.	.	.	.	.	.
1005.87	.	.	.	.	.	.	.	.	.	.	.	.	.
1006.10	.	I	.	.	.	W	X	.	.	E	.	.	R
1006.34	.	.	.	.	.	.	.	.	.	.	.	.	.
1006.57	.	.	.	.	.	.	.	.	.	.	.	.	.
1006.81	.	.	.	.	.	.	.	.	.	.	.	.	.
1007.04	.	.	.	.	.	.	.	.	.	.	.	.	.
1007.28	.	.	.	.	.	.	.	.	.	.	.	.	.
1007.51	.	.	.	.	.	.	.	.	.	.	.	.	.
1007.74	.	.	.	.	.	.	.	.	.	.	.	.	.
1007.98	.	.	.	.	.	.	.	.	.	.	.	.	.
1008.21	.	.	.	.	.	.	.	.	.	.	.	.	.
1008.45	.	.	.	.	.	.	.	.	.	.	.	.	.
1008.68	.	.	.	.	.	.	.	.	.	.	.	.	.
1008.92	.	I	.	.	.	W	X	.	.	E	.	.	R
1009.15	.	.	.	.	.	.	.	.	.	.	.	.	.
1009.39	.	.	.	.	.	.	.	.	.	.	.	.	.
1009.62	.	.	.	.	.	.	.	.	.	.	.	.	.
1009.86	.	.	.	.	.	.	.	.	.	.	.	.	.
1010.09	.	.	.	.	.	.	.	.	.	.	.	.	.
1010.33	.	.	.	.	.	.	.	.	.	.	.	.	.
1010.56	.	I	.	.	.	W	X	.	.	E	.	.	R
1010.80	.	.	.	.	.	.	.	.	.	.	.	.	.
1011.03	.	.	.	.	.	.	.	.	.	.	.	.	.
1011.27	.	.	.	.	.	.	.	.	.	.	.	.	.
1011.50	.	I	.	.	.	X	.	.	.	E	.	.	R
.
1023.79	1023.87	1023.95	1024.03	1024.12	1024.20	1024.28	1024.36	1024.44	1024.52	1024.60			

N O T E S

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2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

DATE: 3/ 9/2022
 TIME: 13:33

F0515P
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT	1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIERS	WIDTH	DIAMETER	WIDTH				DROP										

CD	1	3	0	0.00	0.33	3.00	0.00	0.00	0.00											
----	---	---	---	------	------	------	------	------	------	--	--	--	--	--	--	--	--	--	--	--

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NUMBER 3575

HEADING LINE NO 2 IS -

PARKWAY CULVERT 2

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *
 U/S DATA STATION INVERT SECT
 1000.00 1019.87 1

W S ELEV
 1020.20

ELEMENT NO 2 IS A REACH * * *
 U/S DATA STATION INVERT SECT
 1011.50 1020.10 1

N
 0.012

RADIUS ANGLE ANG PT MAN H
 0.00 0.00 0.00 0

ELEMENT NO 3 IS A SYSTEM HEADWORKS *
 U/S DATA STATION INVERT SECT
 1011.50 1020.10 1

W S ELEV
 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
 LICENSEE: THIENES ENGINEERING F0515P PAGE

1

WATER SURFACE PROFILE LISTING

TEI JOB NUMBER 3575
 PARKWAY CULVERT 2
 100-YEAR

STATION	INVERT	DEPTH	W.S.	Q	VEL	VEL	ENERGY	SUPER	CRITICAL	HGT/	BASE/	ZL	NO
AVBPR	ELEV	OF FLOW	ELEV		HEAD	GRD.EL.	ELEV	DEPTH		DIA	ID NO.	PIER	

L/ELEM	SO		SF AVE	HF		NORM DEPTH	ZR
--------	----	--	--------	----	--	------------	----

1000.00	1019.87	0.270	1020.140	4.5	5.56	0.479	1020.619	0.00	0.330	0.33	3.00	0.00	0
---------	---------	-------	----------	-----	------	-------	----------	------	-------	------	------	------	---

0.82	0.02000					.014221	0.01		0.241			0.00	
------	---------	--	--	--	--	---------	------	--	-------	--	--	------	--

1000.82	1019.89	0.272	1020.158	4.5	5.51	0.472	1020.630	0.00	0.330	0.33	3.00	0.00	0
---------	---------	-------	----------	-----	------	-------	----------	------	-------	------	------	------	---

4.30	0.02000					.013096	0.06		0.241			0.00	
------	---------	--	--	--	--	---------	------	--	-------	--	--	------	--

1005.12	1019.97	0.285	1020.257	4.5	5.26	0.429	1020.686	0.00	0.330	0.33	3.00	0.00	0
---------	---------	-------	----------	-----	------	-------	----------	------	-------	------	------	------	---

0.00

2.88	0.02000					.011286	0.03			0.241		0.00	
1008.00	1020.03	0.299	1020.329	4.5	5.02	0.391	1020.720	0.00	0.330	0.33	3.00	0.00	0
0.00													
2.04	0.02000					.009731	0.02			0.241		0.00	
1010.04	1020.07	0.314	1020.385	4.5	4.78	0.355	1020.740	0.00	0.330	0.33	3.00	0.00	0
0.00													
1.46	0.02000					.008357	0.01			0.241		0.00	
1011.50	1020.10	0.330	1020.430	4.5	4.55	0.321	1020.751	0.00	0.330	0.33	3.00	0.00	0
0.00													

TEI JOB NUMBER 3575
PARKWAY CULVERT 2
100-YEAR

1000.00	.	.	.	.	.	.	.	.	.	.	.	.	.
1000.23	.I			W	X					E			R							
1000.47	.												.							
1000.70	.												.							
1000.94	.I			W	X					E			R							
1001.17	.												.							
1001.41	.												.							
1001.64	.												.							
1001.88	.												.							
1002.11	.												.							
1002.35	.												.							
1002.58	.												.							
1002.82	.												.							
1003.05	.												.							
1003.29	.												.							
1003.52	.												.							
1003.76	.												.							
1003.99	.												.							
1004.22	.												.							
1004.46	.												.							
1004.69	.												.							
1004.93	.												.							
1005.16	.	I				W	HC			E			R							
1005.40	.												.							
1005.63	.												.							
1005.87	.												.							
1006.10	.												.							
1006.34	.												.							
1006.57	.												.							
1006.81	.												.							
1007.04	.												.							
1007.28	.												.							
1007.51	.												.							
1007.74	.												.							
1007.98	.												.							
1008.21	.		I				W X			E			R							
1008.45	.												.							
1008.68	.												.							
1008.92	.												.							
1009.15	.												.							
1009.39	.												.							
1009.62	.												.							
1009.86	.												.							
1010.09	.		I				W X			E			R							
1010.33	.												.							
1010.56	.												.							
1010.80	.												.							
1011.03	.												.							
1011.27	.												.							
1011.50	.		I				X			E			R							
	.												.							
1019.87		1019.96		1020.05		1020.13		1020.22		1020.31		1020.40		1020.49		1020.57		1020.66		1020.75

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1011.27	.			I					WHC		E .	R
1011.50	.			I					X		E.	R

	1018.03	1018.11	1018.18	1018.26	1018.33	1018.41	1018.48	1018.56	1018.63	1018.71	1018.78	

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APPENDIX D

DETENTION CALCULATIONS

TRUCK YARD STORAGE

ELEVATION	DEPTH	VOLUME (C.F.)	VOLUME (AC-FT)	DISCHARGE (cfs)
1006	0	0	0	0.00
1007	1	41247	0.95	0.60
1008	2	112387	2.58	34.00
1009	3	186178	4.27	48.10
1010	4	262640	6.03	59.00
1011	5	341811	7.85	68.10
1012	6	423730	9.73	76.10
1013	7	508435	11.67	83.40
1014	8	595963	13.68	90.10
1015	9	686963	15.77	96.30
1016	10	779646	17.90	102.10
1017	11	875877	20.11	107.60
1018	12	975085	22.38	112.90
1019	13	1077309	24.73	117.00
1020	14	1182586	27.15	122.70
1021	15	1290956	29.64	127.40
1022	16	1402456	32.20	131.80

HOLES @
Bottom of
RISER



AREA = 7.07 ϕ
 $Q = .6(AREA)\sqrt{64.4(h)}$

$h = 1 \quad Q = .6(7.07)\sqrt{64.4(1)} = 34 \text{ cfs}$

$h = 2 \quad Q = .6(7.07)\sqrt{64.4(2)} = 48.1 \text{ cfs}$

$h = 15 \quad Q = .6(7.07)\sqrt{64.4(15)} = 131.8 \text{ cfs}$



Analysis prepared by:

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 LA MIRADA CA 90638
 PH: (714) 521-4811 FAX: (714) 521-4173

***** DESCRIPTION OF STUDY *****
 * LENA AND NORMAN *
 * PROPOSED BASIN *
 * 100-YEAR *

FILE NAME: C:\XDRIVE\3575\BASINB.DAT
 TIME/DATE OF STUDY: 16:51 06/23/2021

 FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 1

 >>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<<
 =====

(UNIT-HYDROGRAPH ADDED TO STREAM #1)

WATERSHED AREA = 291.300 ACRES
 BASEFLOW = 0.000 CFS/SQUARE-MILE
 *USER ENTERED "LAG" TIME = 0.230 HOURS
 CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
 THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
 MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
 VALLEY(DEVELOPED) S-GRAPH SELECTED
 MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) = 0.074
 LOW LOSS FRACTION = 0.127
 HYDROGRAPH MODEL #1 SPECIFIED

SPECIFIED PEAK 5-MINUTES RAINFALL(INCH) = 0.48
 SPECIFIED PEAK 30-MINUTES RAINFALL(INCH) = 1.00
 SPECIFIED PEAK 1-HOUR RAINFALL(INCH) = 1.30
 SPECIFIED PEAK 3-HOUR RAINFALL(INCH) = 1.90
 SPECIFIED PEAK 6-HOUR RAINFALL(INCH) = 2.50
 SPECIFIED PEAK 24-HOUR RAINFALL(INCH) = 5.00

PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
 5-MINUTE FACTOR = 0.987
 30-MINUTE FACTOR = 0.987
 1-HOUR FACTOR = 0.987
 3-HOUR FACTOR = 0.998
 6-HOUR FACTOR = 0.999
 24-HOUR FACTOR = 0.999

UNIT HYDROGRAPH TIME UNIT = 5.000 MINUTES
 UNIT INTERVAL PERCENTAGE OF LAG-TIME = 36.232

RUNOFF HYDROGRAPH LISTING LIMITS:
 MODEL TIME(HOURS) FOR BEGINNING OF RESULTS = 14.00
 MODEL TIME(HOURS) FOR END OF RESULTS = 18.00

 UNIT HYDROGRAPH DETERMINATION

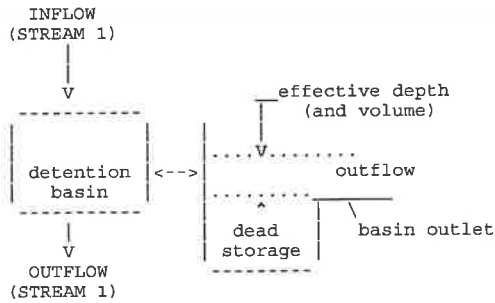
INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES (CFS)
1	2.466	86.871
2	16.085	479.801
3	41.283	887.674
4	69.788	1004.224
5	86.806	599.512
6	94.520	271.764
7	97.754	113.944
8	98.689	32.926
9	99.338	22.862
10	99.735	13.998
11	99.934	6.999
12	100.000	2.333

 TOTAL SOIL-LOSS VOLUME (ACRE-FEET) = 13.2053
 TOTAL STORM RUNOFF VOLUME (ACRE-FEET) = 108.0428

HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS (CFS)
 (Note: Time indicated is at END of Each Unit Intervals)

TIME (HRS)	VOLUME (AF)	Q (CFS)	0.	200.0	400.0	600.0	800.0
14.000	42.4381	59.04	Q	.	V	.	.
14.083	42.8526	60.19	Q	.	V	.	.
14.167	43.2706	60.69	Q	.	V	.	.
14.250	43.6869	60.45	Q	.	V	.	.
14.333	44.1009	60.11	Q	.	V	.	.
14.417	44.5183	60.60	Q	.	V	.	.
14.500	44.9444	61.87	Q	.	V	.	.
14.583	45.3821	63.55	Q	.	V	.	.
14.667	45.8337	65.57	Q	.	V	.	.
14.750	46.3003	67.76	Q	.	V	.	.
14.833	46.7839	70.22	Q	.	V	.	.
14.917	47.2859	72.88	Q	.	V	.	.
15.000	47.8086	75.90	Q	.	V	.	.
15.083	48.3540	79.19	Q	.	V	.	.
15.167	48.9253	82.96	Q	.	V	.	.
15.250	49.5254	87.14	Q	.	V	.	.
15.333	50.1591	92.01	Q	.	V	.	.
15.417	50.8321	97.72	Q	.	V	.	.
15.500	51.5579	105.39	Q	.	V	.	.
15.583	52.3509	115.14	Q	.	V	.	.
15.667	53.2276	127.29	Q	.	V	.	.
15.750	54.2046	141.86	Q	.	V	.	.
15.833	55.3272	163.00	Q	.	V	.	.
15.917	56.6626	193.91	Q	.	V	.	.
16.000	58.3361	242.98	Q	.	V	.	.
16.083	60.6893	341.69	Q	.	V	.	.
16.167	64.4292	543.03	Q	.	V	.	.
16.250	69.2968	706.77	Q	.	V	.	.
16.333	74.1662	707.03	Q	.	V	.	.
16.417	77.5741	494.83	Q	.	V	.	.
16.500	79.7107	310.23	Q	.	V	.	.
16.583	81.1094	203.09	Q	.	V	.	.
16.667	82.0824	141.29	Q	.	V	.	.
16.750	82.8842	116.42	Q	.	V	.	.
16.833	83.5667	99.09	Q	.	V	.	.
16.917	84.1603	86.19	Q	.	V	.	.
17.000	84.6883	76.67	Q	.	V	.	.
17.083	85.1697	69.91	Q	.	V	.	.
17.167	85.6240	65.96	Q	.	V	.	.
17.250	86.0622	63.63	Q	.	V	.	.
17.333	86.4900	62.11	Q	.	V	.	.
17.417	86.9049	60.24	Q	.	V	.	.
17.500	87.3049	58.08	Q	.	V	.	.
17.583	87.6899	55.91	Q	.	V	.	.
17.667	88.0607	53.83	Q	.	V	.	.
17.750	88.4184	51.94	Q	.	V	.	.
17.833	88.7641	50.20	Q	.	V	.	.
17.917	89.0989	48.61	Q	.	V	.	.
18.000	89.4235	47.13	Q	.	V	.	.

 FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 3.1
 >>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<<



ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
 THROUGH A FLOW-THROUGH DETENTION BASIN
 SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 DEAD STORAGE (AF) = 0.000
 SPECIFIED DEAD STORAGE (AF) FILLED = 0.000
 SPECIFIED EFFECTIVE VOLUME (AF) FILLED ABOVE OUTLET = 0.000
 DETENTION BASIN CONSTANT LOSS RATE (CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	1.00	0.60	0.950
3	2.00	34.00	2.580
4	3.00	48.10	4.270
5	4.00	59.00	6.030

6	5.00	68.10	7.850
7	6.00	76.10	9.730
8	7.00	83.40	11.670
9	8.00	90.10	13.680
10	9.00	96.30	15.770
11	10.00	102.10	17.900
12	11.00	107.60	20.110
13	12.00	112.90	22.380
14	13.00	117.90	24.730
15	14.00	122.70	27.150
16	15.00	127.40	29.640
17	16.00	131.80	32.200

=====

MODIFIED-PULS BASIN ROUTING MODEL RESULTS (5-MINUTE COMPUTATION INTERVALS):
 (Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
 MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH (FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME (AF)
12.083	0.000	51.64	0.00	2.84	45.7	4.002
12.167	0.000	50.67	0.00	2.86	46.0	4.034
12.250	0.000	48.43	0.00	2.87	46.2	4.050
12.333	0.000	45.84	0.00	2.87	46.3	4.047
12.417	0.000	44.52	0.00	2.86	46.2	4.035
12.500	0.000	44.25	0.00	2.85	46.1	4.023
12.583	0.000	44.48	0.00	2.85	46.0	4.012
12.667	0.000	44.99	0.00	2.84	45.9	4.006
12.750	0.000	45.54	0.00	2.84	45.9	4.004
12.833	0.000	46.16	0.00	2.84	45.9	4.005
12.917	0.000	46.81	0.00	2.85	45.9	4.012
13.000	0.000	47.52	0.00	2.85	46.0	4.022
13.083	0.000	48.25	0.00	2.86	46.1	4.037
13.167	0.000	49.02	0.00	2.87	46.2	4.056
13.250	0.000	49.81	0.00	2.89	46.4	4.079
13.333	0.000	50.66	0.00	2.90	46.6	4.107
13.417	0.000	51.53	0.00	2.92	46.9	4.139
13.500	0.000	52.45	0.00	2.94	47.2	4.176
13.583	0.000	53.41	0.00	2.97	47.5	4.217
13.667	0.000	54.43	0.00	3.00	47.8	4.262
13.750	0.000	55.48	0.00	3.02	48.2	4.312
13.833	0.000	56.61	0.00	3.06	48.5	4.368
13.917	0.000	57.78	0.00	3.09	48.9	4.429
14.000	0.000	59.04	0.00	3.13	49.3	4.496
14.083	0.000	60.19	0.00	3.17	49.7	4.568
14.167	0.000	60.69	0.00	3.21	50.2	4.641
14.250	0.000	60.45	0.00	3.25	50.6	4.708
14.333	0.000	60.11	0.00	3.28	51.0	4.771
14.417	0.000	60.60	0.00	3.32	51.4	4.834
14.500	0.000	61.87	0.00	3.36	51.8	4.904
14.583	0.000	63.55	0.00	3.40	52.3	4.981
14.667	0.000	65.57	0.00	3.45	52.8	5.070
14.750	0.000	67.76	0.00	3.51	53.4	5.169
14.833	0.000	70.22	0.00	3.57	54.0	5.280
14.917	0.000	72.88	0.00	3.65	54.7	5.405
15.000	0.000	75.90	0.00	3.72	55.6	5.545
15.083	0.000	79.19	0.00	3.81	56.5	5.702
15.167	0.000	82.96	0.00	3.91	57.5	5.877
15.250	0.000	87.14	0.00	4.02	58.6	6.073
15.333	0.000	92.01	0.00	4.15	59.8	6.295
15.417	0.000	97.72	0.00	4.28	61.0	6.548
15.500	0.000	105.39	0.00	4.45	62.3	6.845
15.583	0.000	115.14	0.00	4.64	64.0	7.197
15.667	0.000	127.29	0.00	4.87	65.9	7.620
15.750	0.000	141.86	0.00	5.15	68.1	8.128
15.833	0.000	163.00	0.00	5.49	70.6	8.764
15.917	0.000	193.91	0.00	5.93	73.8	9.592
16.000	0.000	242.98	0.00	6.52	77.7	10.730
16.083	0.000	341.69	0.00	7.42	83.0	12.512
16.167	0.000	543.03	0.00	8.93	91.0	15.625
16.250	0.000	706.77	0.00	10.86	101.3	19.794
16.333	0.000	707.03	0.00	12.65	111.5	23.896
16.417	0.000	494.83	0.00	13.73	118.8	26.486
16.500	0.000	310.23	0.00	14.25	122.6	27.778
16.583	0.000	203.09	0.00	14.47	124.4	28.320
16.667	0.000	141.29	0.00	14.51	125.0	28.432
16.750	0.000	116.42	0.00	14.49	125.1	28.372
16.833	0.000	99.09	0.00	14.42	124.8	28.195
16.917	0.000	86.19	0.00	14.31	124.4	27.932
17.000	0.000	76.67	0.00	14.18	123.9	27.607
17.083	0.000	69.91	0.00	14.04	123.2	27.240
17.167	0.000	65.96	0.00	13.88	122.5	26.850
17.250	0.000	63.63	0.00	13.71	121.7	26.450
17.333	0.000	62.11	0.00	13.54	120.9	26.045
17.417	0.000	60.24	0.00	13.37	120.1	25.633
17.500	0.000	58.08	0.00	13.20	119.3	25.212
17.583	0.000	55.91	0.00	13.02	118.4	24.781
17.667	0.000	53.83	0.00	12.84	117.5	24.342
17.750	0.000	51.94	0.00	12.65	116.6	23.897
17.833	0.000	50.20	0.00	12.45	115.6	23.446
17.917	0.000	48.61	0.00	12.26	114.7	22.991
18.000	0.000	47.13	0.00	12.06	113.7	22.533
18.083	0.000	46.04	0.00	11.86	112.7	22.073
18.167	0.000	46.27	0.00	11.67	111.7	21.623
18.250	0.000	47.85	0.00	11.48	110.6	21.191
18.333	0.000	49.86	0.00	11.29	109.6	20.779

18.417	0.000	50.67	0.00	11.12	108.7	20.379
18.500	0.000	50.52	0.00	10.94	107.8	19.985
18.583	0.000	49.92	0.00	10.77	106.8	19.594
18.667	0.000	49.13	0.00	10.59	105.8	19.203
18.750	0.000	48.34	0.00	10.41	104.9	18.814
18.833	0.000	47.58	0.00	10.24	103.9	18.426
18.917	0.000	46.83	0.00	10.06	102.9	18.040
19.000	0.000	46.10	0.00	9.88	101.9	17.655
19.083	0.000	45.40	0.00	9.71	100.9	17.273
19.167	0.000	44.73	0.00	9.53	99.9	16.893
19.250	0.000	44.09	0.00	9.35	98.8	16.516
19.333	0.000	43.47	0.00	9.17	97.8	16.142
19.417	0.000	42.89	0.00	9.00	96.8	15.770
19.500	0.000	42.32	0.00	8.82	95.8	15.402
19.583	0.000	41.78	0.00	8.65	94.7	15.038
19.667	0.000	41.25	0.00	8.48	93.6	14.677
19.750	0.000	40.75	0.00	8.31	92.5	14.321
19.833	0.000	40.26	0.00	8.14	91.5	13.968
19.917	0.000	39.79	0.00	7.97	90.4	13.619
20.000	0.000	39.34	0.00	7.80	89.3	13.275
20.083	0.000	38.90	0.00	7.63	88.2	12.936
20.167	0.000	38.48	0.00	7.46	87.1	12.601
20.250	0.000	38.07	0.00	7.30	86.0	12.271
20.333	0.000	37.67	0.00	7.14	84.9	11.946
20.417	0.000	37.29	0.00	6.98	83.8	11.626
20.500	0.000	36.91	0.00	6.82	82.6	11.311
20.583	0.000	36.55	0.00	6.66	81.5	11.002
20.667	0.000	36.20	0.00	6.50	80.3	10.698
20.750	0.000	35.86	0.00	6.35	79.2	10.400
20.833	0.000	35.53	0.00	6.19	78.1	10.107
20.917	0.000	35.20	0.00	6.05	77.0	9.819
21.000	0.000	34.89	0.00	5.90	75.9	9.537
21.083	0.000	34.58	0.00	5.75	74.7	9.261
21.167	0.000	34.28	0.00	5.61	73.5	8.990
21.250	0.000	33.99	0.00	5.47	72.4	8.726
21.333	0.000	33.71	0.00	5.33	71.3	8.467
21.417	0.000	33.43	0.00	5.19	70.2	8.214
21.500	0.000	33.16	0.00	5.06	69.1	7.966
21.583	0.000	32.90	0.00	4.93	68.0	7.724
21.667	0.000	32.64	0.00	4.80	66.9	7.489
21.750	0.000	32.39	0.00	4.68	65.7	7.259
21.833	0.000	32.14	0.00	4.55	64.6	7.036
21.917	0.000	31.90	0.00	4.43	63.5	6.818
22.000	0.000	31.67	0.00	4.32	62.4	6.606
22.083	0.000	31.44	0.00	4.20	61.4	6.400
22.167	0.000	31.22	0.00	4.09	60.3	6.200
22.250	0.000	31.00	0.00	3.99	59.3	6.004
22.333	0.000	30.78	0.00	3.88	58.3	5.815
22.417	0.000	30.57	0.00	3.77	57.1	5.632
22.500	0.000	30.36	0.00	3.67	56.0	5.456
22.583	0.000	30.16	0.00	3.58	54.9	5.285
22.667	0.000	29.96	0.00	3.48	53.9	5.121
22.750	0.000	29.77	0.00	3.39	52.9	4.961
22.833	0.000	29.58	0.00	3.31	51.9	4.808
22.917	0.000	29.39	0.00	3.22	51.0	4.659
23.000	0.000	29.21	0.00	3.14	50.1	4.515
23.083	0.000	29.02	0.00	3.06	49.2	4.377
23.167	0.000	28.85	0.00	2.98	48.3	4.242
23.250	0.000	28.67	0.00	2.91	47.3	4.114
23.333	0.000	28.50	0.00	2.84	46.3	3.991
23.417	0.000	28.34	0.00	2.77	45.3	3.875
23.500	0.000	28.17	0.00	2.70	44.3	3.763
23.583	0.000	28.01	0.00	2.64	43.4	3.657
23.667	0.000	27.85	0.00	2.58	42.6	3.556
23.750	0.000	27.69	0.00	2.52	41.7	3.459
23.833	0.000	27.54	0.00	2.47	40.9	3.367
23.917	0.000	27.39	0.00	2.41	40.2	3.279
24.000	0.000	27.24	0.00	2.36	39.5	3.194
24.083	0.000	26.44	0.00	2.31	38.8	3.109
24.167	0.000	22.66	0.00	2.25	38.0	3.004
24.250	0.000	15.82	0.00	2.16	36.9	2.858
24.333	0.000	8.13	0.00	2.05	35.5	2.670
24.417	0.000	3.55	0.00	1.93	33.2	2.466
24.500	0.000	1.48	0.00	1.81	29.7	2.271
24.583	0.000	0.61	0.00	1.70	25.9	2.097
24.667	0.000	0.35	0.00	1.61	22.5	1.944
24.750	0.000	0.18	0.00	1.53	19.6	1.811
24.833	0.000	0.07	0.00	1.46	17.0	1.694
24.917	0.000	0.02	0.00	1.39	14.8	1.592
25.000	0.000	0.00	0.00	1.34	12.8	1.503
25.083	0.000	0.00	0.00	1.29	11.2	1.427
25.167	0.000	0.00	0.00	1.25	9.7	1.360
25.250	0.000	0.00	0.00	1.22	8.4	1.302
25.333	0.000	0.00	0.00	1.19	7.3	1.252
25.417	0.000	0.00	0.00	1.16	6.3	1.208
25.500	0.000	0.00	0.00	1.14	5.5	1.170
25.583	0.000	0.00	0.00	1.11	4.8	1.137
25.667	0.000	0.00	0.00	1.10	4.1	1.109
25.750	0.000	0.00	0.00	1.08	3.6	1.084
25.833	0.000	0.00	0.00	1.07	3.1	1.062
25.917	0.000	0.00	0.00	1.06	2.7	1.044
26.000	0.000	0.00	0.00	1.05	2.4	1.028
26.083	0.000	0.00	0.00	1.04	2.0	1.013
26.167	0.000	0.00	0.00	1.03	1.8	1.001
26.250	0.000	0.00	0.00	1.02	1.5	0.991
26.333	0.000	0.00	0.00	1.02	1.3	0.981
26.417	0.000	0.00	0.00	1.01	1.2	0.973
26.500	0.000	0.00	0.00	1.01	1.0	0.966
26.583	0.000	0.00	0.00	1.01	0.9	0.960

26.667	0.000	0.00	0.00	1.00	0.8	0.955
26.750	0.000	0.00	0.00	1.00	0.7	0.951
26.833	0.000	0.00	0.00	1.00	0.6	0.946
26.917	0.000	0.00	0.00	0.99	0.6	0.942
27.000	0.000	0.00	0.00	0.99	0.6	0.938
27.083	0.000	0.00	0.00	0.98	0.6	0.934
27.167	0.000	0.00	0.00	0.98	0.6	0.930
27.250	0.000	0.00	0.00	0.97	0.6	0.926
27.333	0.000	0.00	0.00	0.97	0.6	0.922
27.417	0.000	0.00	0.00	0.97	0.6	0.918
27.500	0.000	0.00	0.00	0.96	0.6	0.914
27.583	0.000	0.00	0.00	0.96	0.6	0.910
27.667	0.000	0.00	0.00	0.95	0.6	0.906
27.750	0.000	0.00	0.00	0.95	0.6	0.902
27.833	0.000	0.00	0.00	0.95	0.6	0.898
27.917	0.000	0.00	0.00	0.94	0.6	0.894
28.000	0.000	0.00	0.00	0.94	0.6	0.891
28.083	0.000	0.00	0.00	0.93	0.6	0.887
28.167	0.000	0.00	0.00	0.93	0.6	0.883
28.250	0.000	0.00	0.00	0.93	0.6	0.879
28.333	0.000	0.00	0.00	0.92	0.6	0.875
28.417	0.000	0.00	0.00	0.92	0.6	0.871
28.500	0.000	0.00	0.00	0.91	0.5	0.868
28.583	0.000	0.00	0.00	0.91	0.5	0.864
28.667	0.000	0.00	0.00	0.91	0.5	0.860
28.750	0.000	0.00	0.00	0.90	0.5	0.856
28.833	0.000	0.00	0.00	0.90	0.5	0.853
28.917	0.000	0.00	0.00	0.89	0.5	0.849
29.000	0.000	0.00	0.00	0.89	0.5	0.845
29.083	0.000	0.00	0.00	0.89	0.5	0.842
29.167	0.000	0.00	0.00	0.88	0.5	0.838
29.250	0.000	0.00	0.00	0.88	0.5	0.834
29.333	0.000	0.00	0.00	0.87	0.5	0.831
29.417	0.000	0.00	0.00	0.87	0.5	0.827
29.500	0.000	0.00	0.00	0.87	0.5	0.824
29.583	0.000	0.00	0.00	0.86	0.5	0.820
29.667	0.000	0.00	0.00	0.86	0.5	0.816
29.750	0.000	0.00	0.00	0.86	0.5	0.813
29.833	0.000	0.00	0.00	0.85	0.5	0.809
29.917	0.000	0.00	0.00	0.85	0.5	0.806
30.000	0.000	0.00	0.00	0.84	0.5	0.802
30.083	0.000	0.00	0.00	0.84	0.5	0.799
30.167	0.000	0.00	0.00	0.84	0.5	0.795
30.250	0.000	0.00	0.00	0.83	0.5	0.792
30.333	0.000	0.00	0.00	0.83	0.5	0.788
30.417	0.000	0.00	0.00	0.83	0.5	0.785
30.500	0.000	0.00	0.00	0.82	0.5	0.782
30.583	0.000	0.00	0.00	0.82	0.5	0.778
30.667	0.000	0.00	0.00	0.82	0.5	0.775
30.750	0.000	0.00	0.00	0.81	0.5	0.771
30.833	0.000	0.00	0.00	0.81	0.5	0.768
30.917	0.000	0.00	0.00	0.81	0.5	0.765
31.000	0.000	0.00	0.00	0.80	0.5	0.761
31.083	0.000	0.00	0.00	0.80	0.5	0.758
31.167	0.000	0.00	0.00	0.79	0.5	0.755
31.250	0.000	0.00	0.00	0.79	0.5	0.752
31.333	0.000	0.00	0.00	0.79	0.5	0.748
31.417	0.000	0.00	0.00	0.78	0.5	0.745
31.500	0.000	0.00	0.00	0.78	0.5	0.742
31.583	0.000	0.00	0.00	0.78	0.5	0.739
31.667	0.000	0.00	0.00	0.77	0.5	0.735
31.750	0.000	0.00	0.00	0.77	0.5	0.732
31.833	0.000	0.00	0.00	0.77	0.5	0.729
31.917	0.000	0.00	0.00	0.76	0.5	0.726
32.000	0.000	0.00	0.00	0.76	0.5	0.723
32.083	0.000	0.00	0.00	0.76	0.5	0.720
32.167	0.000	0.00	0.00	0.75	0.5	0.716
32.250	0.000	0.00	0.00	0.75	0.5	0.713
32.333	0.000	0.00	0.00	0.75	0.4	0.710
32.417	0.000	0.00	0.00	0.74	0.4	0.707
32.500	0.000	0.00	0.00	0.74	0.4	0.704
32.583	0.000	0.00	0.00	0.74	0.4	0.701
32.667	0.000	0.00	0.00	0.73	0.4	0.698
32.750	0.000	0.00	0.00	0.73	0.4	0.695
32.833	0.000	0.00	0.00	0.73	0.4	0.692
32.917	0.000	0.00	0.00	0.73	0.4	0.689
33.000	0.000	0.00	0.00	0.72	0.4	0.686
33.083	0.000	0.00	0.00	0.72	0.4	0.683
33.167	0.000	0.00	0.00	0.72	0.4	0.680
33.250	0.000	0.00	0.00	0.71	0.4	0.677
33.333	0.000	0.00	0.00	0.71	0.4	0.674
33.417	0.000	0.00	0.00	0.71	0.4	0.671
33.500	0.000	0.00	0.00	0.70	0.4	0.668
33.583	0.000	0.00	0.00	0.70	0.4	0.665
33.667	0.000	0.00	0.00	0.70	0.4	0.663
33.750	0.000	0.00	0.00	0.69	0.4	0.660
33.833	0.000	0.00	0.00	0.69	0.4	0.657
33.917	0.000	0.00	0.00	0.69	0.4	0.654
34.000	0.000	0.00	0.00	0.69	0.4	0.651
34.083	0.000	0.00	0.00	0.68	0.4	0.648
34.167	0.000	0.00	0.00	0.68	0.4	0.645
34.250	0.000	0.00	0.00	0.68	0.4	0.643
34.333	0.000	0.00	0.00	0.67	0.4	0.640
34.417	0.000	0.00	0.00	0.67	0.4	0.637
34.500	0.000	0.00	0.00	0.67	0.4	0.634
34.583	0.000	0.00	0.00	0.66	0.4	0.632
34.667	0.000	0.00	0.00	0.66	0.4	0.629
34.750	0.000	0.00	0.00	0.66	0.4	0.626
34.833	0.000	0.00	0.00	0.66	0.4	0.623

34.917	0.000	0.00	0.00	0.65	0.4	0.621
35.000	0.000	0.00	0.00	0.65	0.4	0.618
35.083	0.000	0.00	0.00	0.65	0.4	0.615
35.167	0.000	0.00	0.00	0.64	0.4	0.613
35.250	0.000	0.00	0.00	0.64	0.4	0.610
35.333	0.000	0.00	0.00	0.64	0.4	0.607
35.417	0.000	0.00	0.00	0.64	0.4	0.605
35.500	0.000	0.00	0.00	0.63	0.4	0.602
35.583	0.000	0.00	0.00	0.63	0.4	0.599
35.667	0.000	0.00	0.00	0.63	0.4	0.597
35.750	0.000	0.00	0.00	0.63	0.4	0.594
35.833	0.000	0.00	0.00	0.62	0.4	0.592
35.917	0.000	0.00	0.00	0.62	0.4	0.589
36.000	0.000	0.00	0.00	0.62	0.4	0.587
36.083	0.000	0.00	0.00	0.61	0.4	0.584
36.167	0.000	0.00	0.00	0.61	0.4	0.581
36.250	0.000	0.00	0.00	0.61	0.4	0.579
36.333	0.000	0.00	0.00	0.61	0.4	0.576
36.417	0.000	0.00	0.00	0.60	0.4	0.574
36.500	0.000	0.00	0.00	0.60	0.4	0.571
36.583	0.000	0.00	0.00	0.60	0.4	0.569
36.667	0.000	0.00	0.00	0.60	0.4	0.567
36.750	0.000	0.00	0.00	0.59	0.4	0.564
36.833	0.000	0.00	0.00	0.59	0.4	0.562
36.917	0.000	0.00	0.00	0.59	0.4	0.559
37.000	0.000	0.00	0.00	0.59	0.4	0.557
37.083	0.000	0.00	0.00	0.58	0.4	0.554
37.167	0.000	0.00	0.00	0.58	0.3	0.552
37.250	0.000	0.00	0.00	0.58	0.3	0.550
37.333	0.000	0.00	0.00	0.58	0.3	0.547
37.417	0.000	0.00	0.00	0.57	0.3	0.545
37.500	0.000	0.00	0.00	0.57	0.3	0.542
37.583	0.000	0.00	0.00	0.57	0.3	0.540
37.667	0.000	0.00	0.00	0.57	0.3	0.538
37.750	0.000	0.00	0.00	0.56	0.3	0.535
37.833	0.000	0.00	0.00	0.56	0.3	0.533
37.917	0.000	0.00	0.00	0.56	0.3	0.531
38.000	0.000	0.00	0.00	0.56	0.3	0.528
38.083	0.000	0.00	0.00	0.55	0.3	0.526
38.167	0.000	0.00	0.00	0.55	0.3	0.524
38.250	0.000	0.00	0.00	0.55	0.3	0.522
38.333	0.000	0.00	0.00	0.55	0.3	0.519
38.417	0.000	0.00	0.00	0.54	0.3	0.517
38.500	0.000	0.00	0.00	0.54	0.3	0.515
38.583	0.000	0.00	0.00	0.54	0.3	0.513
38.667	0.000	0.00	0.00	0.54	0.3	0.510
38.750	0.000	0.00	0.00	0.53	0.3	0.508
38.833	0.000	0.00	0.00	0.53	0.3	0.506
38.917	0.000	0.00	0.00	0.53	0.3	0.504
39.000	0.000	0.00	0.00	0.53	0.3	0.502
39.083	0.000	0.00	0.00	0.53	0.3	0.499
39.167	0.000	0.00	0.00	0.52	0.3	0.497
39.250	0.000	0.00	0.00	0.52	0.3	0.495
39.333	0.000	0.00	0.00	0.52	0.3	0.493
39.417	0.000	0.00	0.00	0.52	0.3	0.491
39.500	0.000	0.00	0.00	0.51	0.3	0.489
39.583	0.000	0.00	0.00	0.51	0.3	0.487
39.667	0.000	0.00	0.00	0.51	0.3	0.484
39.750	0.000	0.00	0.00	0.51	0.3	0.482
39.833	0.000	0.00	0.00	0.51	0.3	0.480
39.917	0.000	0.00	0.00	0.50	0.3	0.478
40.000	0.000	0.00	0.00	0.50	0.3	0.476
40.083	0.000	0.00	0.00	0.50	0.3	0.474
40.167	0.000	0.00	0.00	0.50	0.3	0.472
40.250	0.000	0.00	0.00	0.49	0.3	0.470
40.333	0.000	0.00	0.00	0.49	0.3	0.468
40.417	0.000	0.00	0.00	0.49	0.3	0.466
40.500	0.000	0.00	0.00	0.49	0.3	0.464
40.583	0.000	0.00	0.00	0.49	0.3	0.462
40.667	0.000	0.00	0.00	0.48	0.3	0.460
40.750	0.000	0.00	0.00	0.48	0.3	0.458
40.833	0.000	0.00	0.00	0.48	0.3	0.456
40.917	0.000	0.00	0.00	0.48	0.3	0.454
41.000	0.000	0.00	0.00	0.48	0.3	0.452
41.083	0.000	0.00	0.00	0.47	0.3	0.450
41.167	0.000	0.00	0.00	0.47	0.3	0.448
41.250	0.000	0.00	0.00	0.47	0.3	0.446
41.333	0.000	0.00	0.00	0.47	0.3	0.444
41.417	0.000	0.00	0.00	0.47	0.3	0.442
41.500	0.000	0.00	0.00	0.46	0.3	0.440
41.583	0.000	0.00	0.00	0.46	0.3	0.438
41.667	0.000	0.00	0.00	0.46	0.3	0.436
41.750	0.000	0.00	0.00	0.46	0.3	0.434
41.833	0.000	0.00	0.00	0.46	0.3	0.433
41.917	0.000	0.00	0.00	0.45	0.3	0.431
42.000	0.000	0.00	0.00	0.45	0.3	0.429
42.083	0.000	0.00	0.00	0.45	0.3	0.427
42.167	0.000	0.00	0.00	0.45	0.3	0.425
42.250	0.000	0.00	0.00	0.45	0.3	0.423
42.333	0.000	0.00	0.00	0.44	0.3	0.421
42.417	0.000	0.00	0.00	0.44	0.3	0.420
42.500	0.000	0.00	0.00	0.44	0.3	0.418
42.583	0.000	0.00	0.00	0.44	0.3	0.416
42.667	0.000	0.00	0.00	0.44	0.3	0.414
42.750	0.000	0.00	0.00	0.43	0.3	0.412
42.833	0.000	0.00	0.00	0.43	0.3	0.411
42.917	0.000	0.00	0.00	0.43	0.3	0.409
43.000	0.000	0.00	0.00	0.43	0.3	0.407
43.083	0.000	0.00	0.00	0.43	0.3	0.405

43.167	0.000	0.00	0.00	0.42	0.3	0.404
43.250	0.000	0.00	0.00	0.42	0.3	0.402
43.333	0.000	0.00	0.00	0.42	0.3	0.400
43.417	0.000	0.00	0.00	0.42	0.3	0.398
43.500	0.000	0.00	0.00	0.42	0.3	0.397
43.583	0.000	0.00	0.00	0.42	0.2	0.395
43.667	0.000	0.00	0.00	0.41	0.2	0.393
43.750	0.000	0.00	0.00	0.41	0.2	0.391
43.833	0.000	0.00	0.00	0.41	0.2	0.390
43.917	0.000	0.00	0.00	0.41	0.2	0.388
44.000	0.000	0.00	0.00	0.41	0.2	0.386
44.083	0.000	0.00	0.00	0.40	0.2	0.385
44.167	0.000	0.00	0.00	0.40	0.2	0.383
44.250	0.000	0.00	0.00	0.40	0.2	0.381
44.333	0.000	0.00	0.00	0.40	0.2	0.380
44.417	0.000	0.00	0.00	0.40	0.2	0.378
44.500	0.000	0.00	0.00	0.40	0.2	0.376
44.583	0.000	0.00	0.00	0.39	0.2	0.375
44.667	0.000	0.00	0.00	0.39	0.2	0.373
44.750	0.000	0.00	0.00	0.39	0.2	0.372
44.833	0.000	0.00	0.00	0.39	0.2	0.370
44.917	0.000	0.00	0.00	0.39	0.2	0.368
45.000	0.000	0.00	0.00	0.39	0.2	0.367
45.083	0.000	0.00	0.00	0.38	0.2	0.365
45.167	0.000	0.00	0.00	0.38	0.2	0.364
45.250	0.000	0.00	0.00	0.38	0.2	0.362
45.333	0.000	0.00	0.00	0.38	0.2	0.360
45.417	0.000	0.00	0.00	0.38	0.2	0.359
45.500	0.000	0.00	0.00	0.38	0.2	0.357
45.583	0.000	0.00	0.00	0.37	0.2	0.356
45.667	0.000	0.00	0.00	0.37	0.2	0.354
45.750	0.000	0.00	0.00	0.37	0.2	0.353
45.833	0.000	0.00	0.00	0.37	0.2	0.351
45.917	0.000	0.00	0.00	0.37	0.2	0.350
46.000	0.000	0.00	0.00	0.37	0.2	0.348
46.083	0.000	0.00	0.00	0.36	0.2	0.347
46.167	0.000	0.00	0.00	0.36	0.2	0.345
46.250	0.000	0.00	0.00	0.36	0.2	0.344
46.333	0.000	0.00	0.00	0.36	0.2	0.342
46.417	0.000	0.00	0.00	0.36	0.2	0.341
46.500	0.000	0.00	0.00	0.36	0.2	0.339
46.583	0.000	0.00	0.00	0.36	0.2	0.338
46.667	0.000	0.00	0.00	0.35	0.2	0.336
46.750	0.000	0.00	0.00	0.35	0.2	0.335
46.833	0.000	0.00	0.00	0.35	0.2	0.333
46.917	0.000	0.00	0.00	0.35	0.2	0.332
47.000	0.000	0.00	0.00	0.35	0.2	0.330
47.083	0.000	0.00	0.00	0.35	0.2	0.329
47.167	0.000	0.00	0.00	0.34	0.2	0.327
47.250	0.000	0.00	0.00	0.34	0.2	0.326
47.333	0.000	0.00	0.00	0.34	0.2	0.325
47.417	0.000	0.00	0.00	0.34	0.2	0.323
47.500	0.000	0.00	0.00	0.34	0.2	0.322
47.583	0.000	0.00	0.00	0.34	0.2	0.320
47.667	0.000	0.00	0.00	0.34	0.2	0.319
47.750	0.000	0.00	0.00	0.33	0.2	0.318
47.833	0.000	0.00	0.00	0.33	0.2	0.316
47.917	0.000	0.00	0.00	0.33	0.2	0.315
48.000	0.000	0.00	0.00	0.33	0.2	0.314

PROCESS SUMMARY OF STORAGE:

INFLOW VOLUME = 108.043 AF
 BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
 OUTFLOW VOLUME = 108.042 AF
 LOSS VOLUME = 0.000 AF

END OF FLOODSCx ROUTING ANALYSIS

□

APPENDIX E

CATCH BASIN CALCULATIONS

CURB OPENING BASIN CALCULATION SHEET

Basin Located At 111

h = height of catch basin opening .54 '

H = Maximum depth of ponding at catch basin .56 '

H/h = .56 ' / .54 ' = 1.0 '

Use Table "L" to yield 1.3 cfs/l.f.

Q₁₀₀ at 111 = 1.8 cfs

(Q₁₀₀) / (Table "L" result) = 1.8 / 1.3 = 1.4 = minimum length of opening required to intercept Q.

Length of Catch Basin Recommended = 3.5 '

Basin Located At

h = height of catch basin opening _____ '

H = Maximum depth of ponding at catch basin _____ '

H/h = _____ ' / _____ ' = _____ '

Use Table "L" to yield _____ cfs/l.f.

Q_____ at = _____ cfs

(Q_____)/(Table "L" result) = _____ / _____ = _____ = minimum length of opening required to intercept Q.

Length of Catch Basin Recommended = _____ '

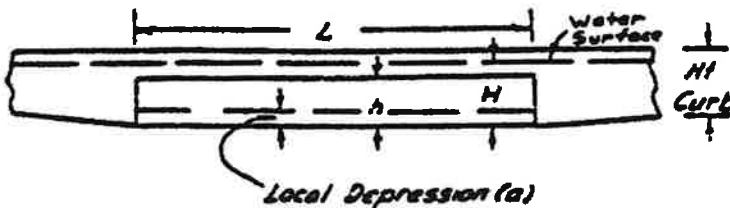
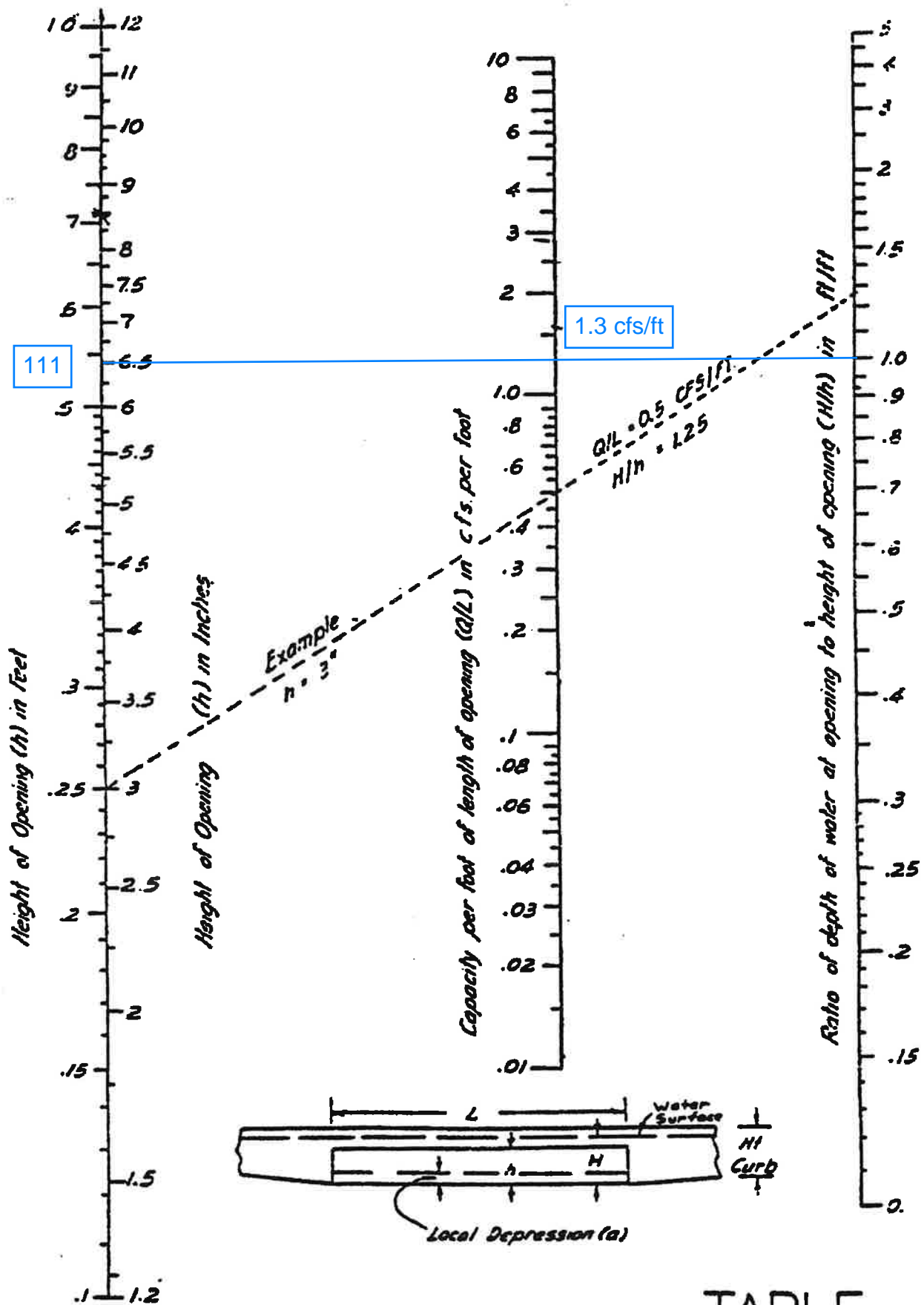


TABLE L

GRATE INLET CALCULATION SHEET

Grate at **101**

Use S.P.P.W.C Standard Plan No. 305-2

$$Q/P = 3.0(H)^{3/2}$$

$$P = \text{Perimeter} = 14.48'$$

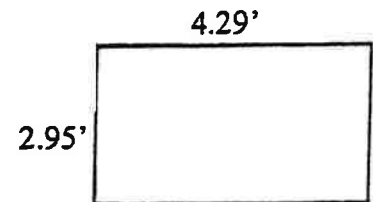
$$H = \text{Maximum depth of ponding at grate} = \underline{.40}'$$

$$Q_{\text{max}} = 3.0(P)(H)^{3/2} = 3.0(14.48)(\underline{.40})^{3/2} = \underline{11.0} \text{ cfs}$$

Assume 50% clogging implies 5.5 cfs

$$Q_{100} \text{ at } \mathbf{101} = \underline{4.3} \text{ cfs} < \underline{5.5} \text{ cfs}$$

1 grate O.K.



Grate at **130**

Use S.P.P.W.C Standard Plan No. 305-2

$$Q/P = 3.0(H)^{3/2}$$

$$P = \text{Perimeter} = 14.48$$

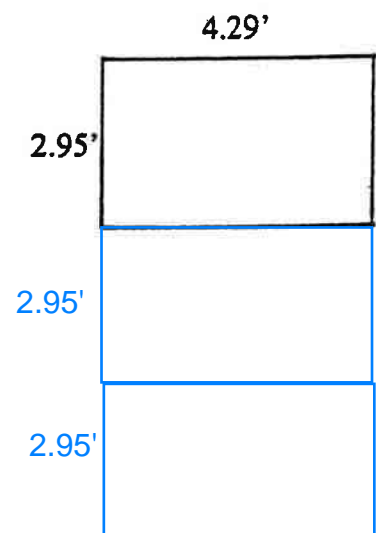
$$H = \text{Maximum depth of ponding at grate} = \underline{0.8}'$$

$$Q_{\text{max}} = 3.0(P)(H)^{3/2} = 3.0 \text{ 26.28 } (\underline{0.8})^{3/2} = \underline{56.4} \text{ cfs}$$

Assume 50% clogging implies 28.2 cfs

$$Q_{100} \text{ at } \mathbf{130} = \underline{7.3} \text{ cfs} < \underline{28.2} \text{ cfs}$$

1 grate O.K.



GRATE INLET CALCULATION SHEET

Grate at 121

Use S.P.P.W.C Standard Plan No. 305-2

$$Q/P = 3.0(H)^{3/2}$$

$$P = \text{Perimeter} = 14.48'$$

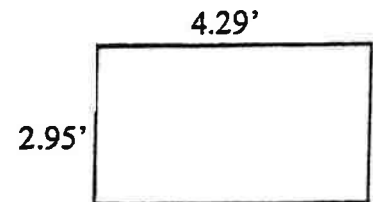
$$H = \text{Maximum depth of ponding at grate} = \underline{.50}'$$

$$Q_{\text{max}} = 3.0(P)(H)^{3/2} = 3.0(14.48)(\underline{.50})^{3/2} = \underline{15.4} \text{ cfs}$$

Assume 50% clogging implies 7.7 cfs

$$Q_{100} \text{ at } \left(\text{span} \right) = \underline{2.4} \text{ cfs} < \underline{7.7} \text{ cfs}$$

1 grate O.K.



Grate at

Use S.P.P.W.C Standard Plan No. 305-2

$$Q/P = 3.0(H)^{3/2}$$

$$P = \text{Perimeter} = 14.48$$

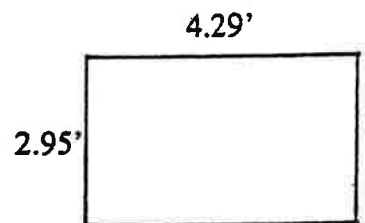
$$H = \text{Maximum depth of ponding at grate} = \underline{\quad}'$$

$$Q_{\text{max}} = 3.0(P)(H)^{3/2} = 3.0(14.48)(\underline{\quad})^{3/2} = \underline{\quad} \text{ cfs}$$

Assume 50% clogging implies cfs

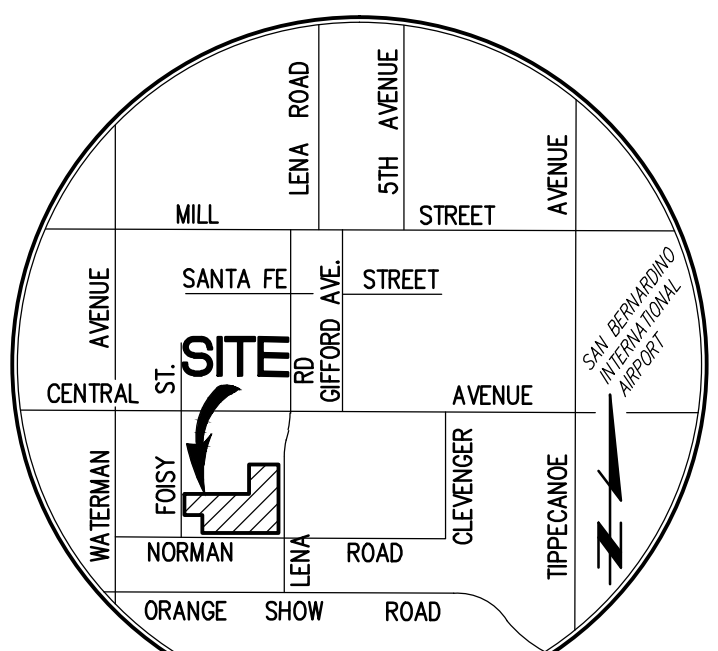
$$Q_{\quad} \text{ at } \left(\text{span} \right) = \underline{\quad} \text{ cfs} < \underline{\quad} \text{ cfs}$$

1 grate O.K.

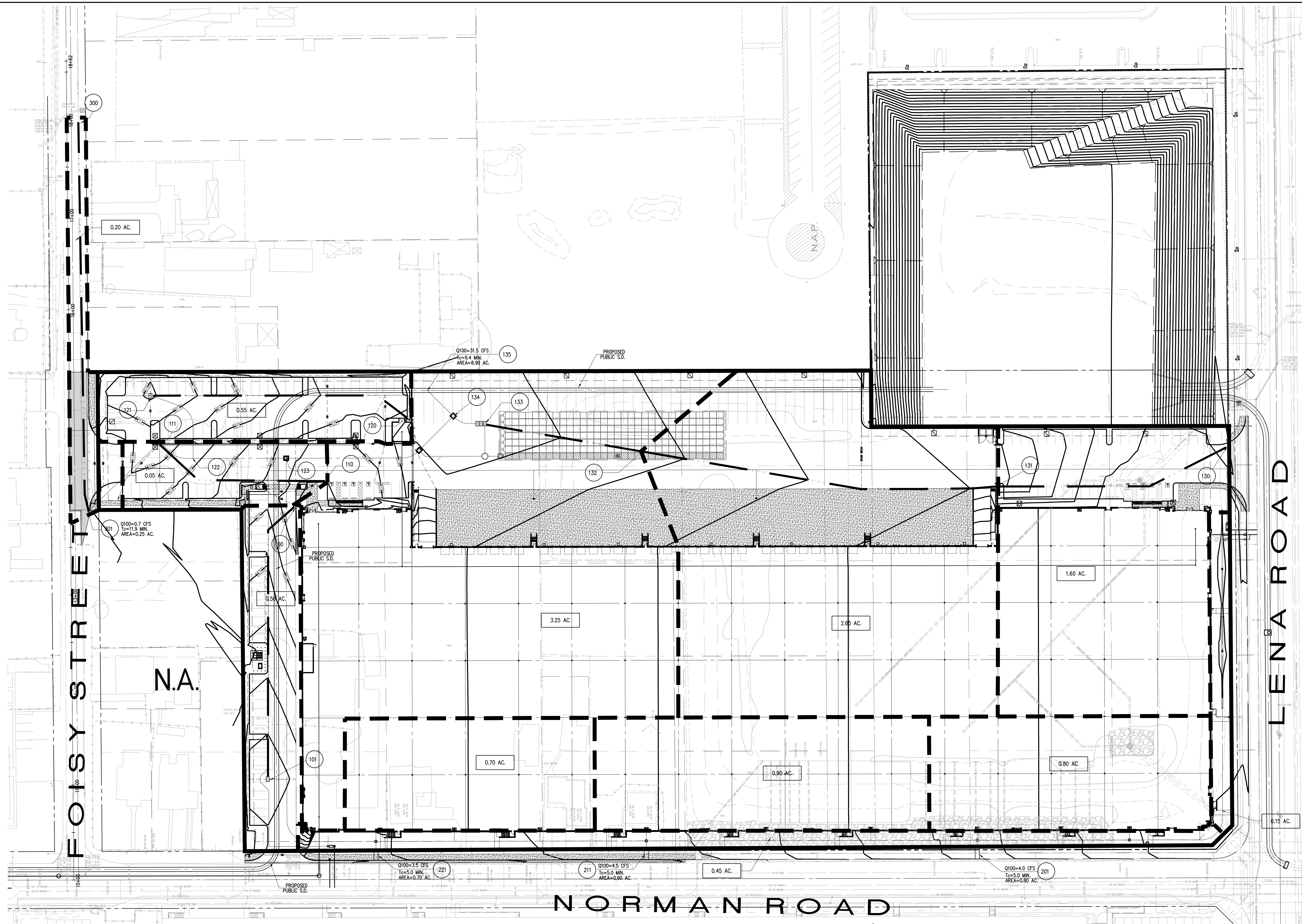


APPENDIX F

HYDROLOGY MAP

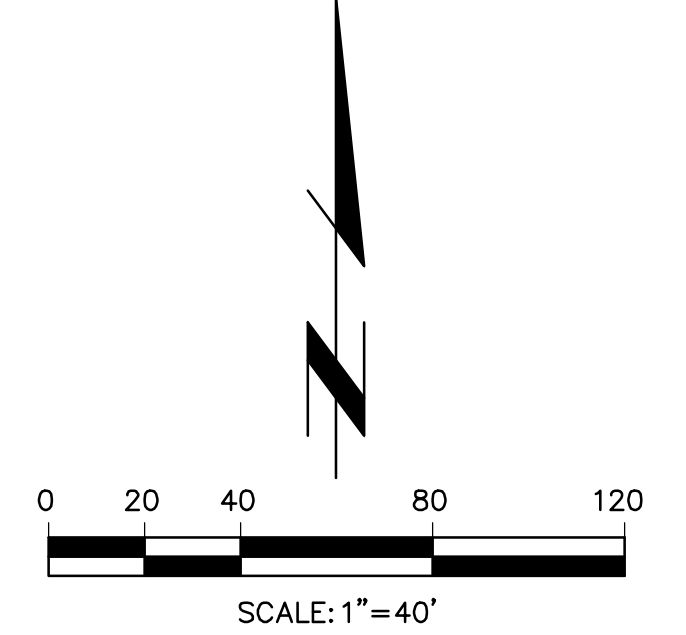


VICINITY MAP
N.T.S.



LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW LINE
- SUBAREA AREA
- NODE NUMBER



PREPARED FOR:
 HILLWOOD INVESTMENTS
 901 WA PEMONTE, SUITE 175
 ONTARIO, CA 91764
 PHONE: (909) 382-0033
 FAX: (909) 382-0073



CITY OF SAN BERNARDINO
 PUBLIC WORKS DEPARTMENT

HYDROLOGY MAP
HILLWOOD GATEWAY SOUTH
BUILDING 8
N/W CORNER OF NORMAN RD.
AND LENA RD.,
SAN BERNARDINO, CA

Designed by _____	Approved by _____
Checked by _____	Date _____
Designed by _____	Public Works Director _____ R.C.E. XXXXX
Checked by _____	Date _____

Sheet **1** of **1** Sheets

3575/1 OF 1 SHEET

Last Update: 3/25/22
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