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# CRYSTAL COVE

## PRELIMINARY HYDROLOGY REPORT

**PEN22-0022 (LST22-0008)**

**Prepared date: January 12, 2022**

**Revised date: May 10, 2022**

**Revised date: July 18, 2022**

**PREPARED FOR:**

**EMPIRE CONSTRUCTION MANAGEMENT, INC.**

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A handwritten signature in black ink, appearing to be "E. Lentz".

7/18/2022

\_\_\_\_\_  
Date

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CRYSTAL COVE

[File: C:\Wspg1\92600\Hydrology Appendix Index]  
JN 926-00

# **CRYSTAL COVE**

## Preliminary Hydrology Report PEN22-0022 (LST22-0008)

### • **Project Location**

### • **Project Description**

### • **Appendices**

#### **Appendix A: Rational Method Hydrology Calculations – Undeveloped Condition**

1. 10-year Storm Calculations
2. 100-year Storm Calculations

#### **Appendix B: Rational Method Hydrology Calculations – Developed Condition**

1. 10-year Storm Calculations
2. 100-year Storm Calculations

#### **Appendix C: Unit Hydrograph Calculations - Undeveloped Condition**

1.  $Q_{100}$  / 24 hr duration storm

#### **Appendix D: Unit Hydrograph and Flood Hydrograph Routing Calculations Basin #1 - Developed Condition**

1.  $Q_{100}$  / 24 hr duration storm

#### **Appendix E: References**

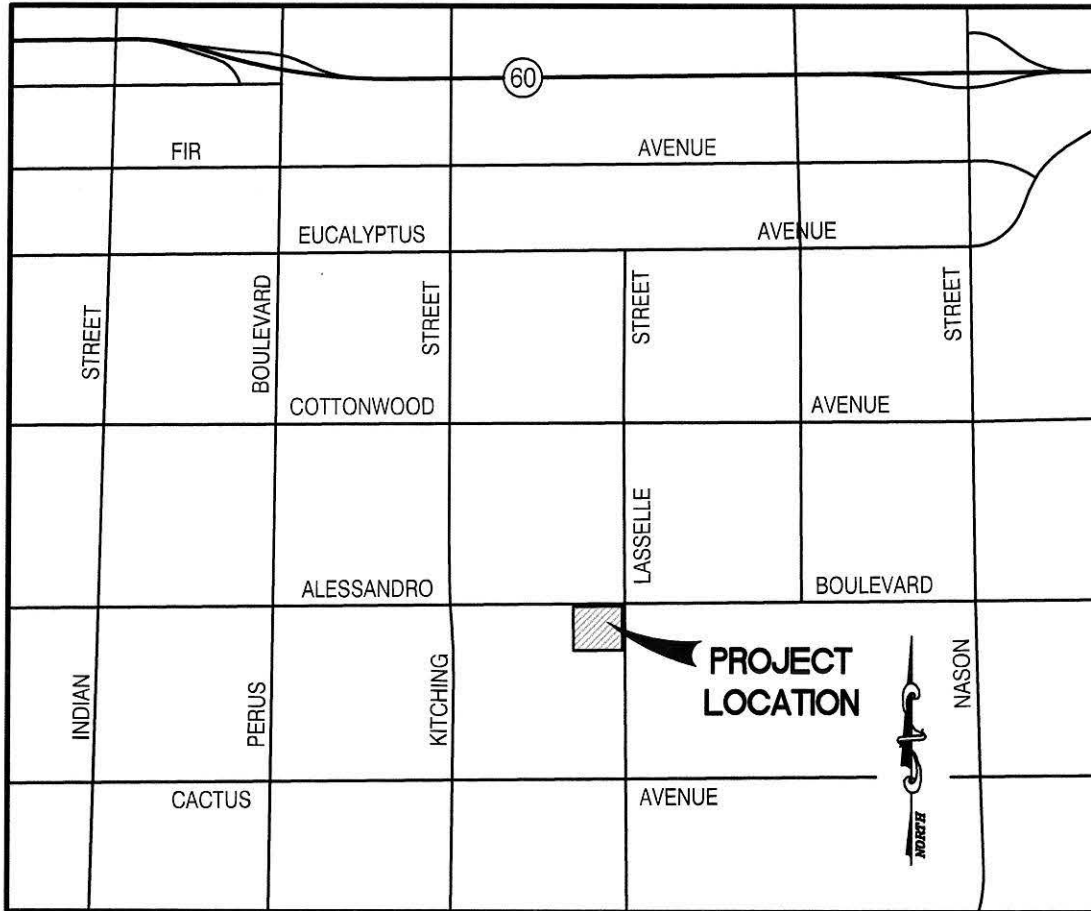
1. Standard Intensity-Duration Curves Data for Elsinore-Wildomar (Plate D-4.1, sheet 6 of 6)
2. Hydrologic Soils Group Map for SunnyMead
3. Point Precipitation Frequency, NOAA Atlas 14, Vol. 6, Ver. 2

#### **Appendix F: Reference Off-site Storm Drain Plans**

1. Lasselle Street Storm Drain Plans – Project No. 06-50182725

#### **Appendix G: Pocket Map Exhibits**

1. Plate 1 –Hydrology Map - Undeveloped Condition
2. Plate 2 – Hydrology Map - Developed Condition



## VICINITY MAP

N.T.S.

## **PURPOSE**

The purpose of this report is to provide hydrologic and hydraulic calculations to support the conceptual design for the storm drain system proposed for Crystal Cove.

## **EXISTING CONDITIONS**

The project site consists of 7.9 acres located in the City of Moreno Valley, County of Riverside, California. The project is located at the southwest corner of the intersection of Alessandro Boulevard and Lasselle Street. The surrounding area consists of vacant land, single family residential, and light commercial properties.

The site is currently vacant, naturally drains in a southwesterly direction. All the surface runoff from the project site ultimately drains into the existing street. The site consist of open brush and natural poor cover. The entire project site consists of soil type B.

The project site can be found on Flood Insurance Rate Map (FIRM) No. 06065C0765G, effective on August 28, 2008, Zone X.

## **PROPOSED CONDITIONS**

The project site proposes 200 units apartment, associated infrastructure. On site runoff will be conveyed through private street improvements. The storm drain pipe will convey the storm runoff to the proposed underground chambers to be detained. Runoff  $Q_{100}=3.0$  cfs exits the underground basin through the use of a pump to a storm drain manhole. From here it drains to the existing 36" storm drain underneath Laselle Street (Project No. 06-50182725), then into Sunnymead MDP Line N-2.

The onsite drainage system shall be designed to ensure that runoff from a 100-year storm of 24 hours duration under developed condition is equal or less than the runoff under existing conditions of the same storm frequency. 24-hour storm duration shall be analyzed to determine the detention.

## **HYDROLOGY**

Hydrologic calculations within this report have been prepared using 2016 Advance Engineering Software's (AES) Rational Method software for Riverside County. Hydrologic variables include "B" soil type. Rainfall intensities as follows: 10 yr - 10 min. = 2.01, 10 yr - 60 min. = 0.82, 100 yr - 10 min. = 2.94, 100 yr - 60 min. = 1.20. Calculations have been prepared for both the 10 and 100 year events.

The software used in running the synthetic unit hydrograph for determination of flood volume, is a program by Civil Design Corporation. Parameters for the hydrograph calculations are specified in the Riverside County Flood Control and Water Conservation Hydrology Manual. The Point Precipitations used are based on data from NOAA Atlas 14, Volume 6, and Version 2, a copy of which is found in Appendix E.

## **CONCLUSIONS**

This drainage report includes the post-development hydrology analyses for the 10 and 100-Yr. storm events. Base on this drainage study, we conclude that the proposed storm drain system provides adequate capacity to convey flows for the 100-Yr. storm.

Comparative runoff, Pre & Post Development

Runoff	Rational Method	
	Pre Development	Post Development
Q <sub>10</sub> (cfs)	<b>7.4</b>	<b>11.6</b>
Q <sub>100</sub> (cfs)	<b>12.4</b>	<b>17.0</b>

CRYSTAL COVE, PEN22-0022 (LST22-0008)  
 UNDERGROUND DETENTION BASIN #1  
 PROJECT 926-00

**UNDERGROUND DETENTION BASIN #1 OUTPUT SUMMARY**

STORM	DURATION	Unit Hydrograph Results		Unit Hydrograph Results		* Basin Routing Results			
		Existing Conditions		Proposed Conditions		Basin Volume Ac.Ft.	Routed Peak CFS	Basin Depth Ft.	W.S. ELEV. Ft.
		Flood Volume Ac.Ft.	Peak Flow CFS	Flood Volume Ac.Ft.	Peak Flow CFS				
100-YEAR	24-HOUR	1.10	3.17	2.40	4.33	0.119	3.00	7.02	1567.02

\* See Flood Hydrograph Routing calculations on Appendix D

\*\*\*\*\*

HYDRAULIC ELEMENTS - I PROGRAM PACKAGE  
(C) Copyright 1982-2016 Advanced Engineering Software (aes)  
Ver. 23.0 Release Date: 07/01/2016 License ID 1269

Analysis prepared by:

MDS Consulting  
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Email: mdsirvine@mdsconsulting.net

-----  
TIME/DATE OF STUDY: 14:54 07/12/2022  
=====

Problem Descriptions:

CRYSTAL COVE, PEN22-0022 (LST22-0008)  
EXISTING 36" SD CAPACITY (LASSELLE STREET)  
Q = 47.1 CFS, S=0.0050

\*\*\*\*\*

>>>>PIPEFLOW HYDRAULIC INPUT INFORMATION<<<<

-----  
PIPE DIAMETER(FEET) = 3.000  
FLOWDEPTH(FEET) = 3.000  
PIPE SLOPE(FEET/FEET) = 0.0050  
MANNINGS FRICTION FACTOR = 0.013000  
>>>> NORMAL DEPTH FLOW(CFS) = 47.16

PER LASSELLE STREET S.D.  
PROJECT NO. 06-50182725  
18.2 + 3.0 CFS = 21.2 ∴ O.K.  
PER PEN 22-0022  
(LST22-0008)





# Appendix A-1

## RATIONAL METHOD CALCULATIONS UNDEVELOPED CONDITION 1. 10 - YEAR STORM

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON  
 RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT  
 (RCFC&WCD) 1978 HYDROLOGY MANUAL  
 (c) Copyright 1982-2016 Advanced Engineering Software (aes)  
 (Rational Tabling Version 23.0)  
 Release Date: 07/01/2016 License ID 1269

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\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*

- \* CRYSTAL COVE \*
- \* PRELIMINARY HYDROLOGY STUDY, UNDEVELOPED CONDITION \*
- \* 10-YEAR STORM EVENT \*

\*\*\*\*\*

FILE NAME: C:\AES2016\HYDROSFT\RATSCX\92600\92600EX.DAT  
 TIME/DATE OF STUDY: 08:42 01/12/2022

-----  
 USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
 -----

USER SPECIFIED STORM EVENT(YEAR) = 10.00  
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00  
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
 10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.010  
 10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.820  
 100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.940  
 100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.200  
 SLOPE OF 10-YEAR INTENSITY-DURATION CURVE = 0.5003939  
 SLOPE OF 100-YEAR INTENSITY-DURATION CURVE = 0.5001161

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 10.00 1-HOUR INTENSITY(INCH/HOUR) = 0.828  
 SLOPE OF INTENSITY DURATION CURVE = 0.5004

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL  
 AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

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

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/ SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	18.0	13.0	0.020/0.020/0.020	0.50	2.00	0.0312	0.125	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.50 FEET  
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

EX10  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*

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

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

=====

ASSUMED INITIAL SUBAREA UNIFORM  
DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER

TC =  $K * [(LENGTH^{**3}) / (ELEVATION CHANGE)]^{**.2}$   
INITIAL SUBAREA FLOW-LENGTH(FEET) = 540.00  
UPSTREAM ELEVATION(FEET) = 1582.00  
DOWNSTREAM ELEVATION(FEET) = 1570.00  
ELEVATION DIFFERENCE(FEET) = 12.00  
TC =  $0.533 * [(540.00^{**3}) / (12.00)]^{**.2}$  = 14.125  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.708  
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5578  
SOIL CLASSIFICATION IS "B"  
SUBAREA RUNOFF(CFS) = 2.31  
TOTAL AREA(ACRES) = 2.42 TOTAL RUNOFF(CFS) = 2.31

\*\*\*\*\*

FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 52

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1570.00 DOWNSTREAM(FEET) = 1568.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 276.00 CHANNEL SLOPE = 0.0072  
CHANNEL FLOW THRU SUBAREA(CFS) = 2.31  
FLOW VELOCITY(FEET/SEC) = 1.51 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 3.05 Tc(MIN.) = 17.17  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 816.00 FEET.

\*\*\*\*\*

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

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

=====

10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.549  
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5369  
SOIL CLASSIFICATION IS "B"  
SUBAREA AREA(ACRES) = 6.15 SUBAREA RUNOFF(CFS) = 5.11  
TOTAL AREA(ACRES) = 8.6 TOTAL RUNOFF(CFS) = 7.42  
TC(MIN.) = 17.17

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 8.6 TC(MIN.) = 17.17  
PEAK FLOW RATE(CFS) = 7.42

=====

END OF RATIONAL METHOD ANALYSIS

# Appendix A-2

## RATIONAL METHOD CALCULATIONS UNDEVELOPED CONDITION 1. 100 - YEAR STORM

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(Rational Tabling Version 23.0)
Release Date: 07/01/2016 License ID 1269

Analysis prepared by:

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\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*

- \* CRYATAL COVE
\* PRELIMINARY HYDROLOGY STUDY, UNDEVELOPED CONDITION
\* 100-YEAR STORM EVENT

FILE NAME: C:\AES2016\HYDROSFT\RATSCX\92600\92600EX.DAT
TIME/DATE OF STUDY: 08:42 01/12/2022

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 18.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.010
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.820
100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.940
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.200
SLOPE OF 10-YEAR INTENSITY-DURATION CURVE = 0.5003939
SLOPE OF 100-YEAR INTENSITY-DURATION CURVE = 0.5001161

COMPUTED RAINFALL INTENSITY DATA:
STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.200
SLOPE OF INTENSITY DURATION CURVE = 0.5001

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

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

Table with 9 columns: NO., WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL: IN- / OUT- / SIDE / SIDE / WAY, CURB HEIGHT (FT), GUTTER-GEOMETRIES: WIDTH (FT), LIP (FT), HIKE (FT), MANNING FACTOR (n). Row 1: 1, 18.0, 13.0, 0.020/0.020/0.020, 0.50, 2.00, 0.0312, 0.125, 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

EX100  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

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

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

=====

ASSUMED INITIAL SUBAREA UNIFORM  
DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER  
TC =  $K * [(LENGTH^{**3}) / (ELEVATION CHANGE)]^{** .2}$   
INITIAL SUBAREA FLOW-LENGTH(FEET) = 540.00  
UPSTREAM ELEVATION(FEET) = 1582.00  
DOWNSTREAM ELEVATION(FEET) = 1570.00  
ELEVATION DIFFERENCE(FEET) = 12.00  
TC =  $0.533 * [(540.00^{**3}) / (12.00)]^{** .2} = 14.125$   
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.474  
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6322  
SOIL CLASSIFICATION IS "B"  
SUBAREA RUNOFF(CFS) = 3.78  
TOTAL AREA(ACRES) = 2.42 TOTAL RUNOFF(CFS) = 3.78

\*\*\*\*\*  
FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 52

-----  
>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<  
>>>>TRAVELTIME THRU SUBAREA<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1570.00 DOWNSTREAM(FEET) = 1568.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 276.00 CHANNEL SLOPE = 0.0072  
CHANNEL FLOW THRU SUBAREA(CFS) = 3.78  
FLOW VELOCITY(FEET/SEC) = 1.68 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 2.73 Tc(MIN.) = 16.86  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 816.00 FEET.

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

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

=====

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.264  
UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6153  
SOIL CLASSIFICATION IS "B"  
SUBAREA AREA(ACRES) = 6.15 SUBAREA RUNOFF(CFS) = 8.57  
TOTAL AREA(ACRES) = 8.6 TOTAL RUNOFF(CFS) = 12.35  
TC(MIN.) = 16.86

-----  
END OF STUDY SUMMARY:  
TOTAL AREA(ACRES) = 8.6 TC(MIN.) = 16.86  
PEAK FLOW RATE(CFS) = 12.35

-----  
END OF RATIONAL METHOD ANALYSIS





# Appendix B-1

## RATIONAL METHOD CALCULATIONS DEVELOPED CONDITION 1. 10 - YEAR STORM

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\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*

\* CRYSTAL COVE \*  
 \* PRELIMINARY HYDROLOGY STUDY, DEVELOPED CONDITION \*  
 \* 10-YEAR STORM EVENT \*  
 \*\*\*\*\*

FILE NAME: C:\AES2016\HYDROSFT\RATSCX\92600\92600DEV.DAT  
 TIME/DATE OF STUDY: 08:42 05/11/2022

-----  
 USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
 -----

USER SPECIFIED STORM EVENT(YEAR) = 10.00  
 SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00  
 SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
 10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.010  
 10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.820  
 100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.940  
 100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.200  
 SLOPE OF 10-YEAR INTENSITY-DURATION CURVE = 0.5003939  
 SLOPE OF 100-YEAR INTENSITY-DURATION CURVE = 0.5001161

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 10.00 1-HOUR INTENSITY(INCH/HOUR) = 0.828  
 SLOPE OF INTENSITY DURATION CURVE = 0.5004

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL  
 AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

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

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN-SIDE / OUT-SIDE / PARK-WAY	CURB HEIGHT (FT)	GUTTER GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	18.0	13.0	0.020/0.020/0.020	0.50	2.00	0.0313	0.125	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.50 FEET  
 as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

DEV10  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*

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

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

=====

ASSUMED INITIAL SUBAREA UNIFORM  
DEVELOPMENT IS APARTMENT

TC =  $K * [(LENGTH^{**3}) / (ELEVATION CHANGE)]^{**0.2}$   
INITIAL SUBAREA FLOW-LENGTH(FEET) = 930.00  
UPSTREAM ELEVATION(FEET) = 1576.00  
DOWNSTREAM ELEVATION(FEET) = 1568.30  
ELEVATION DIFFERENCE(FEET) = 7.70  
TC =  $0.323 * [(930.00^{**3}) / (7.70)]^{**0.2} = 12.960$   
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.783  
APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8334  
SOIL CLASSIFICATION IS "B"  
SUBAREA RUNOFF(CFS) = 4.99  
TOTAL AREA(ACRES) = 3.36 TOTAL RUNOFF(CFS) = 4.99

\*\*\*\*\*

FLOW PROCESS FROM NODE 11.00 TO NODE 21.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1566.10 DOWNSTREAM(FEET) = 1564.30  
FLOW LENGTH(FEET) = 20.00 MANNING'S N = 0.013  
DEPTH OF FLOW IN 12.0 INCH PIPE IS 5.9 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 13.12  
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 4.99  
PIPE TRAVEL TIME(MIN.) = 0.03 Tc(MIN.) = 12.99  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 21.00 = 950.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 21.00 TO NODE 21.00 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.) = 12.99  
RAINFALL INTENSITY(INCH/HR) = 1.78  
TOTAL STREAM AREA(ACRES) = 3.36  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 4.99

\*\*\*\*\*

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

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

=====

ASSUMED INITIAL SUBAREA UNIFORM

DEVELOPMENT IS COMMERCIAL

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2  
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 202.00  
 UPSTREAM ELEVATION(FEET) = 1573.20  
 DOWNSTREAM ELEVATION(FEET) = 1566.20  
 ELEVATION DIFFERENCE(FEET) = 7.00  
 TC = 0.303\*[( 202.00\*\*3)/( 7.00)]\*\*.2 = 4.963  
 COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.  
 10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.872  
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8759  
 SOIL CLASSIFICATION IS "B"  
 SUBAREA RUNOFF(CFS) = 0.35  
 TOTAL AREA(ACRES) = 0.14 TOTAL RUNOFF(CFS) = 0.35

\*\*\*\*\*

FLOW PROCESS FROM NODE 21.00 TO NODE 21.00 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.) = 5.00  
 RAINFALL INTENSITY(INCH/HR) = 2.87  
 TOTAL STREAM AREA(ACRES) = 0.14  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.35

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	4.99	12.99	1.781	3.36
2	0.35	5.00	2.872	0.14

\*\*\*\*\*WARNING\*\*\*\*\*

IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.

\*\*\*\*\*

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	2.27	5.00	2.872
2	5.21	12.99	1.781

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 5.21 Tc(MIN.) = 12.99  
 TOTAL AREA(ACRES) = 3.5  
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 21.00 = 950.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 21.00 TO NODE 53.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1564.30 DOWNSTREAM(FEET) = 1561.20
FLOW LENGTH(FEET) = 117.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 9.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 8.16
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 5.21
PIPE TRAVEL TIME(MIN.) = 0.24 Tc(MIN.) = 13.22
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 53.00 = 1067.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 53.00 TO NODE 53.00 IS CODE = 10

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

\*\*\*\*\*

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

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

ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS APARTMENT
TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 994.00
UPSTREAM ELEVATION(FEET) = 1575.90
DOWNSTREAM ELEVATION(FEET) = 1568.10
ELEVATION DIFFERENCE(FEET) = 7.80
TC = 0.323\*[( 994.00\*\*3)/( 7.80)]\*\*.2 = 13.453
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.750
APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8326
SOIL CLASSIFICATION IS "B"
SUBAREA RUNOFF(CFS) = 5.67
TOTAL AREA(ACRES) = 3.89 TOTAL RUNOFF(CFS) = 5.67

\*\*\*\*\*

FLOW PROCESS FROM NODE 31.00 TO NODE 31.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.45
RAINFALL INTENSITY(INCH/HR) = 1.75
TOTAL STREAM AREA(ACRES) = 3.89
PEAK FLOW RATE(CFS) AT CONFLUENCE = 5.67

\*\*\*\*\*

FLOW PROCESS FROM NODE 40.00 TO NODE 41.00 IS CODE = 21

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

=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS COMMERCIAL

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 140.00
UPSTREAM ELEVATION(FEET) = 1571.40
DOWNSTREAM ELEVATION(FEET) = 1568.00
ELEVATION DIFFERENCE(FEET) = 3.40
TC = 0.303\*[( 140.00\*\*3)/( 3.40)]\*\*.2 = 4.602
COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.872
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8759
SOIL CLASSIFICATION IS "B"
SUBAREA RUNOFF(CFS) = 0.40
TOTAL AREA(ACRES) = 0.16 TOTAL RUNOFF(CFS) = 0.40

\*\*\*\*\*
FLOW PROCESS FROM NODE 41.00 TO NODE 31.00 IS CODE = 31
-----

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

=====
ELEVATION DATA: UPSTREAM(FEET) = 1567.60 DOWNSTREAM(FEET) = 1565.10
FLOW LENGTH(FEET) = 175.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 2.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.33
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.40
PIPE TRAVEL TIME(MIN.) = 0.88 Tc(MIN.) = 5.88
LONGEST FLOWPATH FROM NODE 40.00 TO NODE 31.00 = 315.00 FEET.

\*\*\*\*\*
FLOW PROCESS FROM NODE 31.00 TO NODE 31.00 IS CODE = 81
-----

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

=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.649
APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8490
SOIL CLASSIFICATION IS "B"
SUBAREA AREA(ACRES) = 0.16 SUBAREA RUNOFF(CFS) = 0.36
TOTAL AREA(ACRES) = 0.3 TOTAL RUNOFF(CFS) = 0.76
TC(MIN.) = 5.88

\*\*\*\*\*
FLOW PROCESS FROM NODE 31.00 TO NODE 31.00 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.) = 5.88

RAINFALL INTENSITY(INCH/HR) = 2.65  
TOTAL STREAM AREA(ACRES) = 0.32  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.76

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	5.67	13.45	1.750	3.89
2	0.76	5.88	2.649	0.32

\*\*\*\*\*WARNING\*\*\*\*\*

IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.

\*\*\*\*\*

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	3.24	5.88	2.649
2	6.17	13.45	1.750

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 6.17 Tc(MIN.) = 13.45  
TOTAL AREA(ACRES) = 4.2  
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 31.00 = 994.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 31.00 TO NODE 52.00 IS CODE = 31

-----

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1565.10 DOWNSTREAM(FEET) = 1563.70  
FLOW LENGTH(FEET) = 9.00 MANNING'S N = 0.013  
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000  
DEPTH OF FLOW IN 12.0 INCH PIPE IS 5.7 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 16.97  
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 6.17  
PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 13.46  
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 52.00 = 1003.00 FEET.

\*\*\*\*\*

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

-----

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

=====

TOTAL NUMBER OF STREAMS = 2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MIN.) = 13.46

DEV10

RAINFALL INTENSITY(INCH/HR) = 1.75  
TOTAL STREAM AREA(ACRES) = 4.21  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 6.17

\*\*\*\*\*

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

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

=====

ASSUMED INITIAL SUBAREA UNIFORM  
DEVELOPMENT IS COMMERCIAL

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 202.00  
UPSTREAM ELEVATION(FEET) = 1573.20  
DOWNSTREAM ELEVATION(FEET) = 1566.40  
ELEVATION DIFFERENCE(FEET) = 6.80  
TC = 0.303\*[( 202.00\*\*3)/( 6.80)]\*\*.2 = 4.992  
COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.  
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.872  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8759  
SOIL CLASSIFICATION IS "B"  
SUBAREA RUNOFF(CFS) = 0.38  
TOTAL AREA(ACRES) = 0.15 TOTAL RUNOFF(CFS) = 0.38

\*\*\*\*\*

FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1563.90 DOWNSTREAM(FEET) = 1563.70  
FLOW LENGTH(FEET) = 47.00 MANNING'S N = 0.013  
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000  
DEPTH OF FLOW IN 12.0 INCH PIPE IS 3.3 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.14  
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 0.38  
PIPE TRAVEL TIME(MIN.) = 0.37 Tc(MIN.) = 5.37  
LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 249.00 FEET.

\*\*\*\*\*

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

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

=====

TOTAL NUMBER OF STREAMS = 2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MIN.) = 5.37  
RAINFALL INTENSITY(INCH/HR) = 2.77  
TOTAL STREAM AREA(ACRES) = 0.15  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.38

\*\* CONFLUENCE DATA \*\*



STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	6.17	13.46	1.750	4.21
2	0.38	5.37	2.772	0.15

\*\*\*\*\*WARNING\*\*\*\*\*  
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.  
 \*\*\*\*\*

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	2.84	5.37	2.772
2	6.41	13.46	1.750

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 6.41 Tc(MIN.) = 13.46  
 TOTAL AREA(ACRES) = 4.4  
 LONGEST FLOWPATH FROM NODE 30.00 TO NODE 52.00 = 1003.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 52.00 TO NODE 53.00 IS CODE = 31  
 -----

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1563.70 DOWNSTREAM(FEET) = 1561.20  
 FLOW LENGTH(FEET) = 51.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 12.0 INCH PIPE IS 8.4 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 10.96  
 ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 6.41  
 PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 13.54  
 LONGEST FLOWPATH FROM NODE 30.00 TO NODE 53.00 = 1054.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 53.00 TO NODE 53.00 IS CODE = 11  
 -----

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

=====

\*\* MAIN STREAM CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	6.41	13.54	1.744	4.36

LONGEST FLOWPATH FROM NODE 30.00 TO NODE 53.00 = 1054.00 FEET.

\*\* MEMORY BANK # 1 CONFLUENCE DATA \*\*

STREAM	RUNOFF	Tc	INTENSITY	AREA
--------	--------	----	-----------	------

NUMBER	(CFS)	(MIN.)	(INCH/HOUR)	(ACRE)
1	5.21	13.22	1.765	3.50

LONGEST FLOWPATH FROM NODE 10.00 TO NODE 53.00 = 1067.00 FEET.

\*\*\*\*\*WARNING\*\*\*\*\*  
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED  
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA  
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.  
 \*\*\*\*\*

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	11.47	13.22	1.765
2	11.56	13.54	1.744

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE(CFS) = 11.56 Tc(MIN.) = 13.54  
 TOTAL AREA(ACRES) = 7.9

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 53.00 TO NODE 53.00 IS CODE = 12  
 -----

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

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 31  
 -----

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1561.20 DOWNSTREAM(FEET) = 1560.80  
 FLOW LENGTH(FEET) = 7.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.9 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 13.52  
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 11.56  
 PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 13.55  
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 54.00 = 1074.00 FEET.

=====

END OF STUDY SUMMARY:  
 TOTAL AREA(ACRES) = 7.9 TC(MIN.) = 13.55  
 PEAK FLOW RATE(CFS) = 11.56

=====

END OF RATIONAL METHOD ANALYSIS



# Appendix B-2

## RATIONAL METHOD CALCULATIONS

### DEVELOPED CONDITION

#### 1. 100 - YEAR STORM

<b>MDS</b> CONSULTING	MORSE	17320 Redhill Ave. Suite 350 Irvine, CA 92614
	SCHULTZ	Voice: 949-251-8821 FAX: 949-251-0516
PLANNERS ENGINEERS SURVEYORS		

\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
(RCFC&WCD) 1978 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
(Rational Tabling Version 23.0)
Release Date: 07/01/2016 License ID 1269

Analysis prepared by:

MDS Consulting
17320 Redhill Avenue, Suite 350, Irvine, CA 92614
Phone: (949) 251-8821
Email: mdsirvine@mdsconsulting.net

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*

- \* CRYSTAL COVE
\* PRELIMINARY HYDROLOGY STUDY, DEVELOPED CONDITION
\* 100-YEAR STORM EVENT

\*\*\*\*\*

FILE NAME: C:\AES2016\HYDROSFT\RATSCX\92600\92600DEV.DAT
TIME/DATE OF STUDY: 08:39 05/11/2022

-----
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-----

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
10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.010
10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 0.820
100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) = 2.940
100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) = 1.200
SLOPE OF 10-YEAR INTENSITY-DURATION CURVE = 0.5003939
SLOPE OF 100-YEAR INTENSITY-DURATION CURVE = 0.5001161

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.200
SLOPE OF INTENSITY DURATION CURVE = 0.5001

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

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

Table with 9 columns: NO., HALF-WIDTH (FT), CROWN TO CROSSFALL (FT), STREET-CROSSFALL IN-SIDE / OUT-SIDE/PARK-WAY, CURB HEIGHT (FT), GUTTER WIDTH (FT), GUTTER GEOMETRIES LIP (FT), HIKE (FT), MANNING FACTOR (n). Row 1: 1, 18.0, 13.0, 0.020/0.020/0.020, 0.50, 2.00, 0.0313, 0.125, 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

- 1. Relative Flow-Depth = 0.50 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN

OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

\*\*\*\*\*

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

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

ASSUMED INITIAL SUBAREA UNIFORM DEVELOPMENT IS APARTMENT

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 930.00
UPSTREAM ELEVATION(FEET) = 1576.00
DOWNSTREAM ELEVATION(FEET) = 1568.30
ELEVATION DIFFERENCE(FEET) = 7.70
TC = 0.323\*[( 930.00\*\*3)/( 7.70)]\*\*.2 = 12.960
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.582
APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8481
SOIL CLASSIFICATION IS "B"
SUBAREA RUNOFF(CFS) = 7.36
TOTAL AREA(ACRES) = 3.36 TOTAL RUNOFF(CFS) = 7.36

\*\*\*\*\*

FLOW PROCESS FROM NODE 11.00 TO NODE 21.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1566.10 DOWNSTREAM(FEET) = 1564.30
FLOW LENGTH(FEET) = 20.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.38
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.36
PIPE TRAVEL TIME(MIN.) = 0.02 Tc(MIN.) = 12.98
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 21.00 = 950.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 21.00 TO NODE 21.00 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.) = 12.98
RAINFALL INTENSITY(INCH/HR) = 2.58
TOTAL STREAM AREA(ACRES) = 3.36
PEAK FLOW RATE(CFS) AT CONFLUENCE = 7.36

\*\*\*\*\*

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

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

ASSUMED INITIAL SUBAREA UNIFORM

DEVELOPMENT IS COMMERCIAL

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2  
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 202.00  
 UPSTREAM ELEVATION(FEET) = 1573.20  
 DOWNSTREAM ELEVATION(FEET) = 1566.20  
 ELEVATION DIFFERENCE(FEET) = 7.00  
 TC = 0.303\*[( 202.00\*\*3)/( 7.00)]\*\*.2 = 4.963  
 COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.158  
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8819  
 SOIL CLASSIFICATION IS "B"  
 SUBAREA RUNOFF(CFS) = 0.51  
 TOTAL AREA(ACRES) = 0.14 TOTAL RUNOFF(CFS) = 0.51

\*\*\*\*\*

FLOW PROCESS FROM NODE 21.00 TO NODE 21.00 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.) = 5.00  
 RAINFALL INTENSITY(INCH/HR) = 4.16  
 TOTAL STREAM AREA(ACRES) = 0.14  
 PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.51

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	7.36	12.98	2.580	3.36
2	0.51	5.00	4.158	0.14

\*\*\*\*\*WARNING\*\*\*\*\*

IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.

\*\*\*\*\*

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	3.35	5.00	4.158
2	7.68	12.98	2.580

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 7.68 Tc(MIN.) = 12.98  
 TOTAL AREA(ACRES) = 3.5  
 LONGEST FLOWPATH FROM NODE 10.00 TO NODE 21.00 = 950.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 21.00 TO NODE 53.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1564.30 DOWNSTREAM(FEET) = 1561.20
FLOW LENGTH(FEET) = 117.00 MANNING'S N = 0.013
DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 9.16
ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 7.68
PIPE TRAVEL TIME(MIN.) = 0.21 Tc(MIN.) = 13.20
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 53.00 = 1067.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 53.00 TO NODE 53.00 IS CODE = 10

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

\*\*\*\*\*

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

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

ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS APARTMENT
TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 994.00
UPSTREAM ELEVATION(FEET) = 1575.90
DOWNSTREAM ELEVATION(FEET) = 1568.10
ELEVATION DIFFERENCE(FEET) = 7.80
TC = 0.323\*[( 994.00\*\*3)/( 7.80)]\*\*.2 = 13.453
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.535
APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8474
SOIL CLASSIFICATION IS "B"
SUBAREA RUNOFF(CFS) = 8.35
TOTAL AREA(ACRES) = 3.89 TOTAL RUNOFF(CFS) = 8.35

\*\*\*\*\*

FLOW PROCESS FROM NODE 31.00 TO NODE 31.00 IS CODE = 1

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

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 13.45
RAINFALL INTENSITY(INCH/HR) = 2.53
TOTAL STREAM AREA(ACRES) = 3.89
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.35

\*\*\*\*\*

FLOW PROCESS FROM NODE 40.00 TO NODE 41.00 IS CODE = 21

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

=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS COMMERCIAL

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 140.00
UPSTREAM ELEVATION(FEET) = 1571.40
DOWNSTREAM ELEVATION(FEET) = 1568.00
ELEVATION DIFFERENCE(FEET) = 3.40
TC = 0.303\*[( 140.00\*\*3)/( 3.40)]\*\*.2 = 4.602
COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.158
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8819
SOIL CLASSIFICATION IS "B"
SUBAREA RUNOFF(CFS) = 0.59
TOTAL AREA(ACRES) = 0.16 TOTAL RUNOFF(CFS) = 0.59

\*\*\*\*\*

FLOW PROCESS FROM NODE 41.00 TO NODE 31.00 IS CODE = 31

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

=====
ELEVATION DATA: UPSTREAM(FEET) = 1567.60 DOWNSTREAM(FEET) = 1565.10
FLOW LENGTH(FEET) = 175.00 MANNING'S N = 0.013
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
DEPTH OF FLOW IN 12.0 INCH PIPE IS 3.1 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 3.73
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 0.59
PIPE TRAVEL TIME(MIN.) = 0.78 Tc(MIN.) = 5.78
LONGEST FLOWPATH FROM NODE 40.00 TO NODE 31.00 = 315.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 31.00 TO NODE 31.00 IS CODE = 81

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

=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.867
APARTMENT DEVELOPMENT RUNOFF COEFFICIENT = .8616
SOIL CLASSIFICATION IS "B"
SUBAREA AREA(ACRES) = 0.16 SUBAREA RUNOFF(CFS) = 0.53
TOTAL AREA(ACRES) = 0.3 TOTAL RUNOFF(CFS) = 1.12
TC(MIN.) = 5.78

\*\*\*\*\*

FLOW PROCESS FROM NODE 31.00 TO NODE 31.00 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.) = 5.78



DEV100

RAINFALL INTENSITY(INCH/HR) = 3.87  
TOTAL STREAM AREA(ACRES) = 0.32  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 1.12

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	8.35	13.45	2.535	3.89
2	1.12	5.78	3.867	0.32

\*\*\*\*\*WARNING\*\*\*\*\*

IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.

\*\*\*\*\*

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	4.71	5.78	3.867
2	9.09	13.45	2.535

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 9.09 Tc(MIN.) = 13.45  
TOTAL AREA(ACRES) = 4.2  
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 31.00 = 994.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 31.00 TO NODE 52.00 IS CODE = 31

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1565.10 DOWNSTREAM(FEET) = 1563.70  
FLOW LENGTH(FEET) = 9.00 MANNING'S N = 0.013  
DEPTH OF FLOW IN 12.0 INCH PIPE IS 7.1 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 18.65  
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 9.09  
PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 13.46  
LONGEST FLOWPATH FROM NODE 30.00 TO NODE 52.00 = 1003.00 FEET.

\*\*\*\*\*

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

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

=====

TOTAL NUMBER OF STREAMS = 2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:  
TIME OF CONCENTRATION(MIN.) = 13.46  
RAINFALL INTENSITY(INCH/HR) = 2.53

DEV100

TOTAL STREAM AREA(ACRES) = 4.21  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 9.09

\*\*\*\*\*

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

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

ASSUMED INITIAL SUBAREA UNIFORM  
DEVELOPMENT IS COMMERCIAL

TC = K\*[(LENGTH\*\*3)/(ELEVATION CHANGE)]\*\*.2  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 202.00  
UPSTREAM ELEVATION(FEET) = 1573.20  
DOWNSTREAM ELEVATION(FEET) = 1566.40  
ELEVATION DIFFERENCE(FEET) = 6.80  
TC = 0.303\*[( 202.00\*\*3)/( 6.80)]\*\*.2 = 4.992  
COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.158  
COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8819  
SOIL CLASSIFICATION IS "B"  
SUBAREA RUNOFF(CFS) = 0.55  
TOTAL AREA(ACRES) = 0.15 TOTAL RUNOFF(CFS) = 0.55

\*\*\*\*\*

FLOW PROCESS FROM NODE 51.00 TO NODE 52.00 IS CODE = 31

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

ELEVATION DATA: UPSTREAM(FEET) = 1563.90 DOWNSTREAM(FEET) = 1563.70  
FLOW LENGTH(FEET) = 47.00 MANNING'S N = 0.013  
ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000  
DEPTH OF FLOW IN 12.0 INCH PIPE IS 4.0 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 2.37  
ESTIMATED PIPE DIAMETER(INCH) = 12.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 0.55  
PIPE TRAVEL TIME(MIN.) = 0.33 Tc(MIN.) = 5.33  
LONGEST FLOWPATH FROM NODE 50.00 TO NODE 52.00 = 249.00 FEET.

\*\*\*\*\*

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

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

TOTAL NUMBER OF STREAMS = 2  
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
TIME OF CONCENTRATION(MIN.) = 5.33  
RAINFALL INTENSITY(INCH/HR) = 4.03  
TOTAL STREAM AREA(ACRES) = 0.15  
PEAK FLOW RATE(CFS) AT CONFLUENCE = 0.55

\*\* CONFLUENCE DATA \*\*

STREAM RUNOFF Tc INTENSITY AREA

NUMBER	(CFS)	(MIN.)	(INCH/HOUR)	(ACRE)
1	9.09	13.46	2.534	4.21
2	0.55	5.33	4.027	0.15

\*\*\*\*\*WARNING\*\*\*\*\*  
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED  
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA  
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.  
 \*\*\*\*\*

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

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	4.15	5.33	4.027
2	9.44	13.46	2.534

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 9.44 Tc(MIN.) = 13.46  
 TOTAL AREA(ACRES) = 4.4  
 LONGEST FLOWPATH FROM NODE 30.00 TO NODE 52.00 = 1003.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 52.00 TO NODE 53.00 IS CODE = 31  
 -----

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 1563.70 DOWNSTREAM(FEET) = 1561.20  
 FLOW LENGTH(FEET) = 51.00 MANNING'S N = 0.013  
 DEPTH OF FLOW IN 15.0 INCH PIPE IS 9.0 INCHES  
 PIPE-FLOW VELOCITY(FEET/SEC.) = 12.20  
 ESTIMATED PIPE DIAMETER(INCH) = 15.00 NUMBER OF PIPES = 1  
 PIPE-FLOW(CFS) = 9.44  
 PIPE TRAVEL TIME(MIN.) = 0.07 Tc(MIN.) = 13.53  
 LONGEST FLOWPATH FROM NODE 30.00 TO NODE 53.00 = 1054.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 53.00 TO NODE 53.00 IS CODE = 11  
 -----

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

\*\* MAIN STREAM CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.44	13.53	2.527	4.36

LONGEST FLOWPATH FROM NODE 30.00 TO NODE 53.00 = 1054.00 FEET.

\*\* MEMORY BANK # 1 CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
---------------	--------------	-----------	-----------------------	-------------

DEV100

1 7.68 13.20 2.559 3.50  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 53.00 = 1067.00 FEET.

\*\*\*\*\*WARNING\*\*\*\*\*

IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED  
ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA  
WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.

\*\*\*\*\*

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	16.88	13.20	2.559
2	17.02	13.53	2.527

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:

PEAK FLOW RATE(CFS) = 17.02 Tc(MIN.) = 13.53  
TOTAL AREA(ACRES) = 7.9

\*\*\*\*\*

FLOW PROCESS FROM NODE 53.00 TO NODE 53.00 IS CODE = 12

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

\*\*\*\*\*

FLOW PROCESS FROM NODE 53.00 TO NODE 54.00 IS CODE = 31

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

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

ELEVATION DATA: UPSTREAM(FEET) = 1561.20 DOWNSTREAM(FEET) = 1560.80  
FLOW LENGTH(FEET) = 7.00 MANNING'S N = 0.013  
DEPTH OF FLOW IN 18.0 INCH PIPE IS 11.0 INCHES  
PIPE-FLOW VELOCITY(FEET/SEC.) = 14.96  
ESTIMATED PIPE DIAMETER(INCH) = 18.00 NUMBER OF PIPES = 1  
PIPE-FLOW(CFS) = 17.02  
PIPE TRAVEL TIME(MIN.) = 0.01 Tc(MIN.) = 13.54  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 54.00 = 1074.00 FEET.

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 7.9 TC(MIN.) = 13.54  
PEAK FLOW RATE(CFS) = 17.02

END OF RATIONAL METHOD ANALYSIS





# Appendix C

## UNIT HYDROGRAPH CALCULATIONS UNDEVELOPED CONDITION

### 1. Q100 / 24 HR DURATION STORM

**MDS**  
CONSULTING

MORSE

SCHULTZ

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PLANNERS ENGINEERS SURVEYORS

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012, Version 8.2  
Study date 05/05/22 File: Pre9260024100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6328

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
Pre Development  
100-yr / 24-hr Storm

-----  
Drainage Area = 8.02(Ac.) = 0.013 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 8.02(Ac.) =  
0.013 Sq. Mi.  
USER Entry of lag time in hours  
Lag time = 0.281 Hr.  
Lag time = 16.86 Min.  
25% of lag time = 4.22 Min.  
40% of lag time = 6.74 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.02	1.96	15.72

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.02	4.83	38.74

STORM EVENT (YEAR) = 100.00  
 Area Averaged 2-Year Rainfall = 1.960(In)  
 Area Averaged 100-Year Rainfall = 4.830(In)

Point rain (area averaged) = 4.830(In)  
 Areal adjustment factor = 100.00 %  
 Adjusted average point rain = 4.830(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
8.020	61.00	0.000
Total Area Entered = 8.02(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-3	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
61.0	78.8	0.258	0.000	0.258	1.000	0.258
Sum (F) =						0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258  
 Minimum soil loss rate ((In/Hr)) = 0.129  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.900

Unit Hydrograph  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	29.656	2.855
2	0.167	59.312	10.409
3	0.250	88.968	18.236
4	0.333	118.624	20.077
5	0.417	148.280	13.008
6	0.500	177.936	7.514
7	0.583	207.592	4.803
8	0.667	237.248	3.738
9	0.750	266.904	3.010
10	0.833	296.560	2.517
11	0.917	326.216	2.014
12	1.000	355.872	1.772
13	1.083	385.528	1.457
14	1.167	415.184	1.258
15	1.250	444.840	0.991
16	1.333	474.496	0.929
17	1.417	504.152	0.888
18	1.500	533.808	0.740
19	1.583	563.464	0.640
20	1.667	593.120	0.551
21	1.750	622.776	0.499
22	1.833	652.432	0.418



Pre9260024100

23	1.917	682.088	0.347	0.028
24	2.000	711.744	0.297	0.024
25	2.083	741.400	0.297	0.024
26	2.167	771.056	0.297	0.024
27	2.250	800.712	0.438	0.035
Sum = 100.000			Sum=	8.083

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
				Max	Low	
1	0.08	0.07	0.039	( 0.458)	0.035	0.004
2	0.17	0.07	0.039	( 0.456)	0.035	0.004
3	0.25	0.07	0.039	( 0.454)	0.035	0.004
4	0.33	0.10	0.058	( 0.452)	0.052	0.006
5	0.42	0.10	0.058	( 0.451)	0.052	0.006
6	0.50	0.10	0.058	( 0.449)	0.052	0.006
7	0.58	0.10	0.058	( 0.447)	0.052	0.006
8	0.67	0.10	0.058	( 0.445)	0.052	0.006
9	0.75	0.10	0.058	( 0.444)	0.052	0.006
10	0.83	0.13	0.077	( 0.442)	0.070	0.008
11	0.92	0.13	0.077	( 0.440)	0.070	0.008
12	1.00	0.13	0.077	( 0.438)	0.070	0.008
13	1.08	0.10	0.058	( 0.437)	0.052	0.006
14	1.17	0.10	0.058	( 0.435)	0.052	0.006
15	1.25	0.10	0.058	( 0.433)	0.052	0.006
16	1.33	0.10	0.058	( 0.431)	0.052	0.006
17	1.42	0.10	0.058	( 0.430)	0.052	0.006
18	1.50	0.10	0.058	( 0.428)	0.052	0.006
19	1.58	0.10	0.058	( 0.426)	0.052	0.006
20	1.67	0.10	0.058	( 0.425)	0.052	0.006
21	1.75	0.10	0.058	( 0.423)	0.052	0.006
22	1.83	0.13	0.077	( 0.421)	0.070	0.008
23	1.92	0.13	0.077	( 0.420)	0.070	0.008
24	2.00	0.13	0.077	( 0.418)	0.070	0.008
25	2.08	0.13	0.077	( 0.416)	0.070	0.008
26	2.17	0.13	0.077	( 0.414)	0.070	0.008
27	2.25	0.13	0.077	( 0.413)	0.070	0.008
28	2.33	0.13	0.077	( 0.411)	0.070	0.008
29	2.42	0.13	0.077	( 0.409)	0.070	0.008
30	2.50	0.13	0.077	( 0.408)	0.070	0.008
31	2.58	0.17	0.097	( 0.406)	0.087	0.010
32	2.67	0.17	0.097	( 0.404)	0.087	0.010
33	2.75	0.17	0.097	( 0.403)	0.087	0.010
34	2.83	0.17	0.097	( 0.401)	0.087	0.010
35	2.92	0.17	0.097	( 0.399)	0.087	0.010
36	3.00	0.17	0.097	( 0.398)	0.087	0.010
37	3.08	0.17	0.097	( 0.396)	0.087	0.010
38	3.17	0.17	0.097	( 0.394)	0.087	0.010
39	3.25	0.17	0.097	( 0.393)	0.087	0.010
40	3.33	0.17	0.097	( 0.391)	0.087	0.010

41	3.42	0.17	0.097	( 0.390)	0.087	0.010
42	3.50	0.17	0.097	( 0.388)	0.087	0.010
43	3.58	0.17	0.097	( 0.386)	0.087	0.010
44	3.67	0.17	0.097	( 0.385)	0.087	0.010
45	3.75	0.17	0.097	( 0.383)	0.087	0.010
46	3.83	0.20	0.116	( 0.381)	0.104	0.012
47	3.92	0.20	0.116	( 0.380)	0.104	0.012
48	4.00	0.20	0.116	( 0.378)	0.104	0.012
49	4.08	0.20	0.116	( 0.377)	0.104	0.012
50	4.17	0.20	0.116	( 0.375)	0.104	0.012
51	4.25	0.20	0.116	( 0.373)	0.104	0.012
52	4.33	0.23	0.135	( 0.372)	0.122	0.014
53	4.42	0.23	0.135	( 0.370)	0.122	0.014
54	4.50	0.23	0.135	( 0.369)	0.122	0.014
55	4.58	0.23	0.135	( 0.367)	0.122	0.014
56	4.67	0.23	0.135	( 0.366)	0.122	0.014
57	4.75	0.23	0.135	( 0.364)	0.122	0.014
58	4.83	0.27	0.155	( 0.362)	0.139	0.015
59	4.92	0.27	0.155	( 0.361)	0.139	0.015
60	5.00	0.27	0.155	( 0.359)	0.139	0.015
61	5.08	0.20	0.116	( 0.358)	0.104	0.012
62	5.17	0.20	0.116	( 0.356)	0.104	0.012
63	5.25	0.20	0.116	( 0.355)	0.104	0.012
64	5.33	0.23	0.135	( 0.353)	0.122	0.014
65	5.42	0.23	0.135	( 0.351)	0.122	0.014
66	5.50	0.23	0.135	( 0.350)	0.122	0.014
67	5.58	0.27	0.155	( 0.348)	0.139	0.015
68	5.67	0.27	0.155	( 0.347)	0.139	0.015
69	5.75	0.27	0.155	( 0.345)	0.139	0.015
70	5.83	0.27	0.155	( 0.344)	0.139	0.015
71	5.92	0.27	0.155	( 0.342)	0.139	0.015
72	6.00	0.27	0.155	( 0.341)	0.139	0.015
73	6.08	0.30	0.174	( 0.339)	0.156	0.017
74	6.17	0.30	0.174	( 0.338)	0.156	0.017
75	6.25	0.30	0.174	( 0.336)	0.156	0.017
76	6.33	0.30	0.174	( 0.335)	0.156	0.017
77	6.42	0.30	0.174	( 0.333)	0.156	0.017
78	6.50	0.30	0.174	( 0.332)	0.156	0.017
79	6.58	0.33	0.193	( 0.330)	0.174	0.019
80	6.67	0.33	0.193	( 0.329)	0.174	0.019
81	6.75	0.33	0.193	( 0.327)	0.174	0.019
82	6.83	0.33	0.193	( 0.326)	0.174	0.019
83	6.92	0.33	0.193	( 0.324)	0.174	0.019
84	7.00	0.33	0.193	( 0.323)	0.174	0.019
85	7.08	0.33	0.193	( 0.321)	0.174	0.019
86	7.17	0.33	0.193	( 0.320)	0.174	0.019
87	7.25	0.33	0.193	( 0.318)	0.174	0.019
88	7.33	0.37	0.213	( 0.317)	0.191	0.021
89	7.42	0.37	0.213	( 0.316)	0.191	0.021
90	7.50	0.37	0.213	( 0.314)	0.191	0.021
91	7.58	0.40	0.232	( 0.313)	0.209	0.023
92	7.67	0.40	0.232	( 0.311)	0.209	0.023
93	7.75	0.40	0.232	( 0.310)	0.209	0.023
94	7.83	0.43	0.251	( 0.308)	0.226	0.025

95	7.92	0.43	0.251	( 0.307)	0.226	0.025
96	8.00	0.43	0.251	( 0.306)	0.226	0.025
97	8.08	0.50	0.290	( 0.304)	0.261	0.029
98	8.17	0.50	0.290	( 0.303)	0.261	0.029
99	8.25	0.50	0.290	( 0.301)	0.261	0.029
100	8.33	0.50	0.290	( 0.300)	0.261	0.029
101	8.42	0.50	0.290	( 0.298)	0.261	0.029
102	8.50	0.50	0.290	( 0.297)	0.261	0.029
103	8.58	0.53	0.309	( 0.296)	0.278	0.031
104	8.67	0.53	0.309	( 0.294)	0.278	0.031
105	8.75	0.53	0.309	( 0.293)	0.278	0.031
106	8.83	0.57	0.328	0.292 ( 0.296)		0.037
107	8.92	0.57	0.328	0.290 ( 0.296)		0.038
108	9.00	0.57	0.328	0.289 ( 0.296)		0.040
109	9.08	0.63	0.367	0.287 ( 0.330)		0.080
110	9.17	0.63	0.367	0.286 ( 0.330)		0.081
111	9.25	0.63	0.367	0.285 ( 0.330)		0.082
112	9.33	0.67	0.386	0.283 ( 0.348)		0.103
113	9.42	0.67	0.386	0.282 ( 0.348)		0.104
114	9.50	0.67	0.386	0.281 ( 0.348)		0.106
115	9.58	0.70	0.406	0.279 ( 0.365)		0.126
116	9.67	0.70	0.406	0.278 ( 0.365)		0.128
117	9.75	0.70	0.406	0.277 ( 0.365)		0.129
118	9.83	0.73	0.425	0.275 ( 0.383)		0.150
119	9.92	0.73	0.425	0.274 ( 0.383)		0.151
120	10.00	0.73	0.425	0.273 ( 0.383)		0.152
121	10.08	0.50	0.290	( 0.271)	0.261	0.029
122	10.17	0.50	0.290	( 0.270)	0.261	0.029
123	10.25	0.50	0.290	( 0.269)	0.261	0.029
124	10.33	0.50	0.290	( 0.267)	0.261	0.029
125	10.42	0.50	0.290	( 0.266)	0.261	0.029
126	10.50	0.50	0.290	( 0.265)	0.261	0.029
127	10.58	0.67	0.386	0.263 ( 0.348)		0.123
128	10.67	0.67	0.386	0.262 ( 0.348)		0.124
129	10.75	0.67	0.386	0.261 ( 0.348)		0.125
130	10.83	0.67	0.386	0.260 ( 0.348)		0.127
131	10.92	0.67	0.386	0.258 ( 0.348)		0.128
132	11.00	0.67	0.386	0.257 ( 0.348)		0.129
133	11.08	0.63	0.367	0.256 ( 0.330)		0.111
134	11.17	0.63	0.367	0.255 ( 0.330)		0.113
135	11.25	0.63	0.367	0.253 ( 0.330)		0.114
136	11.33	0.63	0.367	0.252 ( 0.330)		0.115
137	11.42	0.63	0.367	0.251 ( 0.330)		0.116
138	11.50	0.63	0.367	0.250 ( 0.330)		0.118
139	11.58	0.57	0.328	0.248 ( 0.296)		0.080
140	11.67	0.57	0.328	0.247 ( 0.296)		0.081
141	11.75	0.57	0.328	0.246 ( 0.296)		0.083
142	11.83	0.60	0.348	0.245 ( 0.313)		0.103
143	11.92	0.60	0.348	0.243 ( 0.313)		0.104
144	12.00	0.60	0.348	0.242 ( 0.313)		0.106
145	12.08	0.83	0.483	0.241 ( 0.435)		0.242
146	12.17	0.83	0.483	0.240 ( 0.435)		0.243
147	12.25	0.83	0.483	0.239 ( 0.435)		0.244
148	12.33	0.87	0.502	0.237 ( 0.452)		0.265

149	12.42	0.87	0.502	0.236	( 0.452)	0.266
150	12.50	0.87	0.502	0.235	( 0.452)	0.267
151	12.58	0.93	0.541	0.234	( 0.487)	0.307
152	12.67	0.93	0.541	0.233	( 0.487)	0.308
153	12.75	0.93	0.541	0.231	( 0.487)	0.309
154	12.83	0.97	0.560	0.230	( 0.504)	0.330
155	12.92	0.97	0.560	0.229	( 0.504)	0.331
156	13.00	0.97	0.560	0.228	( 0.504)	0.332
157	13.08	1.13	0.657	0.227	( 0.591)	0.430
158	13.17	1.13	0.657	0.226	( 0.591)	0.431
159	13.25	1.13	0.657	0.225	( 0.591)	0.432
160	13.33	1.13	0.657	0.223	( 0.591)	0.433
161	13.42	1.13	0.657	0.222	( 0.591)	0.435
162	13.50	1.13	0.657	0.221	( 0.591)	0.436
163	13.58	0.77	0.444	0.220	( 0.400)	0.224
164	13.67	0.77	0.444	0.219	( 0.400)	0.225
165	13.75	0.77	0.444	0.218	( 0.400)	0.227
166	13.83	0.77	0.444	0.217	( 0.400)	0.228
167	13.92	0.77	0.444	0.216	( 0.400)	0.229
168	14.00	0.77	0.444	0.214	( 0.400)	0.230
169	14.08	0.90	0.522	0.213	( 0.469)	0.308
170	14.17	0.90	0.522	0.212	( 0.469)	0.309
171	14.25	0.90	0.522	0.211	( 0.469)	0.310
172	14.33	0.87	0.502	0.210	( 0.452)	0.292
173	14.42	0.87	0.502	0.209	( 0.452)	0.293
174	14.50	0.87	0.502	0.208	( 0.452)	0.294
175	14.58	0.87	0.502	0.207	( 0.452)	0.295
176	14.67	0.87	0.502	0.206	( 0.452)	0.296
177	14.75	0.87	0.502	0.205	( 0.452)	0.298
178	14.83	0.83	0.483	0.204	( 0.435)	0.279
179	14.92	0.83	0.483	0.203	( 0.435)	0.280
180	15.00	0.83	0.483	0.202	( 0.435)	0.281
181	15.08	0.80	0.464	0.201	( 0.417)	0.263
182	15.17	0.80	0.464	0.200	( 0.417)	0.264
183	15.25	0.80	0.464	0.199	( 0.417)	0.265
184	15.33	0.77	0.444	0.198	( 0.400)	0.247
185	15.42	0.77	0.444	0.197	( 0.400)	0.248
186	15.50	0.77	0.444	0.196	( 0.400)	0.249
187	15.58	0.63	0.367	0.195	( 0.330)	0.173
188	15.67	0.63	0.367	0.194	( 0.330)	0.174
189	15.75	0.63	0.367	0.193	( 0.330)	0.175
190	15.83	0.63	0.367	0.192	( 0.330)	0.176
191	15.92	0.63	0.367	0.191	( 0.330)	0.177
192	16.00	0.63	0.367	0.190	( 0.330)	0.177
193	16.08	0.13	0.077	( 0.189)	0.070	0.008
194	16.17	0.13	0.077	( 0.188)	0.070	0.008
195	16.25	0.13	0.077	( 0.187)	0.070	0.008
196	16.33	0.13	0.077	( 0.186)	0.070	0.008
197	16.42	0.13	0.077	( 0.185)	0.070	0.008
198	16.50	0.13	0.077	( 0.184)	0.070	0.008
199	16.58	0.10	0.058	( 0.183)	0.052	0.006
200	16.67	0.10	0.058	( 0.182)	0.052	0.006
201	16.75	0.10	0.058	( 0.181)	0.052	0.006
202	16.83	0.10	0.058	( 0.180)	0.052	0.006

203	16.92	0.10	0.058	( 0.179)	0.052	0.006
204	17.00	0.10	0.058	( 0.178)	0.052	0.006
205	17.08	0.17	0.097	( 0.177)	0.087	0.010
206	17.17	0.17	0.097	( 0.177)	0.087	0.010
207	17.25	0.17	0.097	( 0.176)	0.087	0.010
208	17.33	0.17	0.097	( 0.175)	0.087	0.010
209	17.42	0.17	0.097	( 0.174)	0.087	0.010
210	17.50	0.17	0.097	( 0.173)	0.087	0.010
211	17.58	0.17	0.097	( 0.172)	0.087	0.010
212	17.67	0.17	0.097	( 0.171)	0.087	0.010
213	17.75	0.17	0.097	( 0.170)	0.087	0.010
214	17.83	0.13	0.077	( 0.170)	0.070	0.008
215	17.92	0.13	0.077	( 0.169)	0.070	0.008
216	18.00	0.13	0.077	( 0.168)	0.070	0.008
217	18.08	0.13	0.077	( 0.167)	0.070	0.008
218	18.17	0.13	0.077	( 0.166)	0.070	0.008
219	18.25	0.13	0.077	( 0.165)	0.070	0.008
220	18.33	0.13	0.077	( 0.165)	0.070	0.008
221	18.42	0.13	0.077	( 0.164)	0.070	0.008
222	18.50	0.13	0.077	( 0.163)	0.070	0.008
223	18.58	0.10	0.058	( 0.162)	0.052	0.006
224	18.67	0.10	0.058	( 0.161)	0.052	0.006
225	18.75	0.10	0.058	( 0.161)	0.052	0.006
226	18.83	0.07	0.039	( 0.160)	0.035	0.004
227	18.92	0.07	0.039	( 0.159)	0.035	0.004
228	19.00	0.07	0.039	( 0.158)	0.035	0.004
229	19.08	0.10	0.058	( 0.158)	0.052	0.006
230	19.17	0.10	0.058	( 0.157)	0.052	0.006
231	19.25	0.10	0.058	( 0.156)	0.052	0.006
232	19.33	0.13	0.077	( 0.155)	0.070	0.008
233	19.42	0.13	0.077	( 0.155)	0.070	0.008
234	19.50	0.13	0.077	( 0.154)	0.070	0.008
235	19.58	0.10	0.058	( 0.153)	0.052	0.006
236	19.67	0.10	0.058	( 0.153)	0.052	0.006
237	19.75	0.10	0.058	( 0.152)	0.052	0.006
238	19.83	0.07	0.039	( 0.151)	0.035	0.004
239	19.92	0.07	0.039	( 0.151)	0.035	0.004
240	20.00	0.07	0.039	( 0.150)	0.035	0.004
241	20.08	0.10	0.058	( 0.149)	0.052	0.006
242	20.17	0.10	0.058	( 0.149)	0.052	0.006
243	20.25	0.10	0.058	( 0.148)	0.052	0.006
244	20.33	0.10	0.058	( 0.147)	0.052	0.006
245	20.42	0.10	0.058	( 0.147)	0.052	0.006
246	20.50	0.10	0.058	( 0.146)	0.052	0.006
247	20.58	0.10	0.058	( 0.145)	0.052	0.006
248	20.67	0.10	0.058	( 0.145)	0.052	0.006
249	20.75	0.10	0.058	( 0.144)	0.052	0.006
250	20.83	0.07	0.039	( 0.144)	0.035	0.004
251	20.92	0.07	0.039	( 0.143)	0.035	0.004
252	21.00	0.07	0.039	( 0.142)	0.035	0.004
253	21.08	0.10	0.058	( 0.142)	0.052	0.006
254	21.17	0.10	0.058	( 0.141)	0.052	0.006
255	21.25	0.10	0.058	( 0.141)	0.052	0.006
256	21.33	0.07	0.039	( 0.140)	0.035	0.004

257	21.42	0.07	0.039	( 0.140)	0.035	0.004
258	21.50	0.07	0.039	( 0.139)	0.035	0.004
259	21.58	0.10	0.058	( 0.139)	0.052	0.006
260	21.67	0.10	0.058	( 0.138)	0.052	0.006
261	21.75	0.10	0.058	( 0.138)	0.052	0.006
262	21.83	0.07	0.039	( 0.137)	0.035	0.004
263	21.92	0.07	0.039	( 0.137)	0.035	0.004
264	22.00	0.07	0.039	( 0.136)	0.035	0.004
265	22.08	0.10	0.058	( 0.136)	0.052	0.006
266	22.17	0.10	0.058	( 0.135)	0.052	0.006
267	22.25	0.10	0.058	( 0.135)	0.052	0.006
268	22.33	0.07	0.039	( 0.135)	0.035	0.004
269	22.42	0.07	0.039	( 0.134)	0.035	0.004
270	22.50	0.07	0.039	( 0.134)	0.035	0.004
271	22.58	0.07	0.039	( 0.133)	0.035	0.004
272	22.67	0.07	0.039	( 0.133)	0.035	0.004
273	22.75	0.07	0.039	( 0.133)	0.035	0.004
274	22.83	0.07	0.039	( 0.132)	0.035	0.004
275	22.92	0.07	0.039	( 0.132)	0.035	0.004
276	23.00	0.07	0.039	( 0.132)	0.035	0.004
277	23.08	0.07	0.039	( 0.131)	0.035	0.004
278	23.17	0.07	0.039	( 0.131)	0.035	0.004
279	23.25	0.07	0.039	( 0.131)	0.035	0.004
280	23.33	0.07	0.039	( 0.130)	0.035	0.004
281	23.42	0.07	0.039	( 0.130)	0.035	0.004
282	23.50	0.07	0.039	( 0.130)	0.035	0.004
283	23.58	0.07	0.039	( 0.130)	0.035	0.004
284	23.67	0.07	0.039	( 0.130)	0.035	0.004
285	23.75	0.07	0.039	( 0.129)	0.035	0.004
286	23.83	0.07	0.039	( 0.129)	0.035	0.004
287	23.92	0.07	0.039	( 0.129)	0.035	0.004
288	24.00	0.07	0.039	( 0.129)	0.035	0.004

(Loss Rate Not Used)

Sum = 100.0

Sum = 19.2

Flood volume = Effective rainfall 1.60(In)  
 times area 8.0(Ac.)/[ (In)/(Ft.) ] = 1.1(Ac.Ft)  
 Total soil loss = 3.23(In)  
 Total soil loss = 2.157(Ac.Ft)  
 Total rainfall = 4.83(In)  
 Flood volume = 46638.9 Cubic Feet  
 Total soil loss = 93972.8 Cubic Feet

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 Peak flow rate of this hydrograph = 3.165(CFS)  
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 24 - 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  
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Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q				

0+10	0.0000	0.00	Q
0+15	0.0001	0.01	Q
0+20	0.0002	0.02	Q
0+25	0.0004	0.02	Q
0+30	0.0006	0.03	Q
0+35	0.0008	0.03	Q
0+40	0.0010	0.04	Q
0+45	0.0013	0.04	Q
0+50	0.0016	0.04	Q
0+55	0.0018	0.04	Q
1+ 0	0.0022	0.05	Q
1+ 5	0.0025	0.05	Q
1+10	0.0029	0.05	Q
1+15	0.0032	0.05	Q
1+20	0.0035	0.05	Q
1+25	0.0038	0.05	Q
1+30	0.0042	0.05	Q
1+35	0.0045	0.05	Q
1+40	0.0048	0.05	Q
1+45	0.0051	0.05	Q
1+50	0.0055	0.05	Q
1+55	0.0058	0.05	Q
2+ 0	0.0061	0.05	Q
2+ 5	0.0065	0.05	Q
2+10	0.0069	0.06	Q
2+15	0.0073	0.06	Q
2+20	0.0077	0.06	Q
2+25	0.0081	0.06	Q
2+30	0.0086	0.06	Q
2+35	0.0090	0.06	Q
2+40	0.0094	0.06	Q
2+45	0.0099	0.07	Q
2+50	0.0103	0.07	Q
2+55	0.0108	0.07	Q
3+ 0	0.0113	0.07	Q
3+ 5	0.0118	0.07	Q
3+10	0.0124	0.07	Q
3+15	0.0129	0.07	Q
3+20	0.0134	0.08	Q
3+25	0.0139	0.08	Q
3+30	0.0144	0.08	Q
3+35	0.0150	0.08	Q
3+40	0.0155	0.08	Q
3+45	0.0160	0.08	Q
3+50	0.0166	0.08	Q
3+55	0.0171	0.08	Q
4+ 0	0.0177	0.08	Q
4+ 5	0.0183	0.09	Q
4+10	0.0189	0.09	Q
4+15	0.0195	0.09	Q
4+20	0.0201	0.09	Q
4+25	0.0207	0.09	Q
4+30	0.0214	0.10	Q
4+35	0.0221	0.10	Q

4+40	0.0228	0.10	Q
4+45	0.0235	0.10	Q
4+50	0.0242	0.10	Q
4+55	0.0250	0.11	Q
5+ 0	0.0257	0.11	Q
5+ 5	0.0265	0.11	Q
5+10	0.0273	0.11	QV
5+15	0.0280	0.11	QV
5+20	0.0287	0.10	QV
5+25	0.0294	0.10	QV
5+30	0.0302	0.10	QV
5+35	0.0309	0.11	QV
5+40	0.0316	0.11	QV
5+45	0.0324	0.11	QV
5+50	0.0332	0.12	QV
5+55	0.0340	0.12	QV
6+ 0	0.0349	0.12	QV
6+ 5	0.0357	0.12	QV
6+10	0.0365	0.12	QV
6+15	0.0374	0.13	QV
6+20	0.0383	0.13	QV
6+25	0.0392	0.13	QV
6+30	0.0402	0.13	QV
6+35	0.0411	0.14	QV
6+40	0.0421	0.14	QV
6+45	0.0430	0.14	QV
6+50	0.0440	0.15	QV
6+55	0.0451	0.15	QV
7+ 0	0.0461	0.15	QV
7+ 5	0.0471	0.15	QV
7+10	0.0482	0.15	QV
7+15	0.0492	0.15	QV
7+20	0.0503	0.15	QV
7+25	0.0513	0.16	QV
7+30	0.0524	0.16	QV
7+35	0.0536	0.16	Q V
7+40	0.0547	0.17	Q V
7+45	0.0559	0.17	Q V
7+50	0.0571	0.18	Q V
7+55	0.0583	0.18	Q V
8+ 0	0.0596	0.18	Q V
8+ 5	0.0609	0.19	Q V
8+10	0.0623	0.20	Q V
8+15	0.0637	0.20	Q V
8+20	0.0651	0.21	Q V
8+25	0.0666	0.22	Q V
8+30	0.0681	0.22	Q V
8+35	0.0697	0.22	Q V
8+40	0.0712	0.23	Q V
8+45	0.0728	0.23	Q V
8+50	0.0745	0.24	Q V
8+55	0.0762	0.25	Q V
9+ 0	0.0779	0.26	QV
9+ 5	0.0799	0.28	QV



9+10	0.0821	0.33	Q V			
9+15	0.0848	0.40	Q V			
9+20	0.0881	0.47	Q V			
9+25	0.0919	0.54	QV			
9+30	0.0960	0.61	QV			
9+35	0.1006	0.67	QV			
9+40	0.1056	0.73	QV			
9+45	0.1110	0.79	QV			
9+50	0.1169	0.85	QV			
9+55	0.1231	0.91	QV			
10+ 0	0.1298	0.97	QV			
10+ 5	0.1367	1.00	Q V			
10+10	0.1432	0.94	Q V			
10+15	0.1486	0.79	Q V			
10+20	0.1527	0.61	Q V			
10+25	0.1562	0.49	Q V			
10+30	0.1591	0.43	Q V			
10+35	0.1620	0.42	Q V			
10+40	0.1653	0.47	Q V			
10+45	0.1694	0.59	Q V			
10+50	0.1744	0.73	Q V			
10+55	0.1800	0.82	Q V			
11+ 0	0.1860	0.87	Q V			
11+ 5	0.1922	0.90	Q V			
11+10	0.1985	0.91	Q V			
11+15	0.2048	0.91	Q V			
11+20	0.2110	0.90	Q V			
11+25	0.2172	0.90	Q V			
11+30	0.2234	0.90	Q V			
11+35	0.2296	0.90	Q V			
11+40	0.2357	0.88	Q V			
11+45	0.2414	0.83	Q V			
11+50	0.2468	0.78	Q V			
11+55	0.2521	0.77	Q V			
12+ 0	0.2574	0.78	Q V			
12+ 5	0.2632	0.84	Q V			
12+10	0.2699	0.97	Q V			
12+15	0.2780	1.18	Q V			
12+20	0.2878	1.41	Q V			
12+25	0.2987	1.58	Q V			
12+30	0.3104	1.70	Q V			
12+35	0.3229	1.81	Q V			
12+40	0.3360	1.91	Q V			
12+45	0.3500	2.02	Q V			
12+50	0.3647	2.14	Q V			
12+55	0.3800	2.23	Q V			
13+ 0	0.3959	2.31	Q V			
13+ 5	0.4125	2.41	Q V			
13+10	0.4301	2.55	Q V			
13+15	0.4489	2.73	Q V			
13+20	0.4691	2.93	Q V			
13+25	0.4902	3.06	Q V			
13+30	0.5119	3.15	Q V			
13+35	0.5337	3.16	Q V			

13+40	0.5546	3.04		Q	V	
13+45	0.5737	2.77		Q	V	
13+50	0.5906	2.46		Q	V	
13+55	0.6063	2.28		Q	V	
14+ 0	0.6213	2.18		Q	V	
14+ 5	0.6361	2.14		Q	V	
14+10	0.6510	2.17		Q	V	
14+15	0.6665	2.25		Q	V	
14+20	0.6827	2.35		Q	V	
14+25	0.6992	2.40		Q	V	
14+30	0.7158	2.40		Q	V	
14+35	0.7323	2.39		Q	V	
14+40	0.7487	2.39		Q	V	
14+45	0.7652	2.39		Q	V	
14+50	0.7817	2.39		Q	V	
14+55	0.7981	2.38		Q	V	
15+ 0	0.8144	2.36		Q	V	
15+ 5	0.8304	2.33		Q	V	
15+10	0.8462	2.30		Q	V	
15+15	0.8618	2.26		Q	V	
15+20	0.8771	2.23		Q	V	
15+25	0.8922	2.19		Q	V	
15+30	0.9070	2.15		Q	V	
15+35	0.9215	2.10		Q	V	
15+40	0.9353	2.01		Q	V	
15+45	0.9482	1.88		Q	V	
15+50	0.9602	1.75		Q	V	
15+55	0.9717	1.66		Q	V	
16+ 0	0.9828	1.62		Q	V	
16+ 5	0.9935	1.55		Q	V	
16+10	1.0030	1.38		Q	V	
16+15	1.0107	1.12		Q	V	
16+20	1.0164	0.82		Q	V	
16+25	1.0207	0.63		Q	V	
16+30	1.0243	0.52		Q	V	
16+35	1.0273	0.44		Q	V	
16+40	1.0299	0.38		Q	V	
16+45	1.0322	0.33		Q	V	
16+50	1.0341	0.28		Q	V	
16+55	1.0358	0.24		Q	V	
17+ 0	1.0373	0.21		Q	V	
17+ 5	1.0386	0.19		Q	V	
17+10	1.0397	0.17		Q	V	
17+15	1.0408	0.16		Q	V	
17+20	1.0419	0.15		Q	V	
17+25	1.0428	0.14		Q	V	
17+30	1.0437	0.13		Q	V	
17+35	1.0445	0.12		Q	V	
17+40	1.0453	0.11		Q	V	
17+45	1.0460	0.10		Q	V	
17+50	1.0467	0.10		Q	V	
17+55	1.0473	0.09		Q	V	
18+ 0	1.0479	0.08		Q	V	
18+ 5	1.0484	0.08		Q	V	

18+10	1.0489	0.07	Q				V
18+15	1.0493	0.07	Q				V
18+20	1.0498	0.06	Q				V
18+25	1.0502	0.06	Q				V
18+30	1.0507	0.06	Q				V
18+35	1.0511	0.06	Q				V
18+40	1.0515	0.06	Q				V
18+45	1.0519	0.06	Q				V
18+50	1.0523	0.05	Q				V
18+55	1.0527	0.05	Q				V
19+ 0	1.0530	0.05	Q				V
19+ 5	1.0533	0.04	Q				V
19+10	1.0536	0.04	Q				V
19+15	1.0539	0.04	Q				V
19+20	1.0542	0.05	Q				V
19+25	1.0545	0.05	Q				V
19+30	1.0549	0.05	Q				V
19+35	1.0553	0.05	Q				V
19+40	1.0557	0.06	Q				V
19+45	1.0560	0.05	Q				V
19+50	1.0564	0.05	Q				V
19+55	1.0567	0.05	Q				V
20+ 0	1.0570	0.04	Q				V
20+ 5	1.0573	0.04	Q				V
20+10	1.0575	0.04	Q				V
20+15	1.0578	0.04	Q				V
20+20	1.0581	0.04	Q				V
20+25	1.0584	0.04	Q				V
20+30	1.0588	0.05	Q				V
20+35	1.0591	0.05	Q				V
20+40	1.0594	0.05	Q				V
20+45	1.0597	0.05	Q				V
20+50	1.0600	0.05	Q				V
20+55	1.0603	0.04	Q				V
21+ 0	1.0606	0.04	Q				V
21+ 5	1.0609	0.04	Q				V
21+10	1.0611	0.04	Q				V
21+15	1.0614	0.04	Q				V
21+20	1.0617	0.04	Q				V
21+25	1.0620	0.04	Q				V
21+30	1.0623	0.04	Q				V
21+35	1.0625	0.04	Q				V
21+40	1.0628	0.04	Q				V
21+45	1.0631	0.04	Q				V
21+50	1.0634	0.04	Q				V
21+55	1.0636	0.04	Q				V
22+ 0	1.0639	0.04	Q				V
22+ 5	1.0642	0.04	Q				V
22+10	1.0644	0.04	Q				V
22+15	1.0647	0.04	Q				V
22+20	1.0650	0.04	Q				V
22+25	1.0653	0.04	Q				V
22+30	1.0655	0.04	Q				V
22+35	1.0658	0.04	Q				V

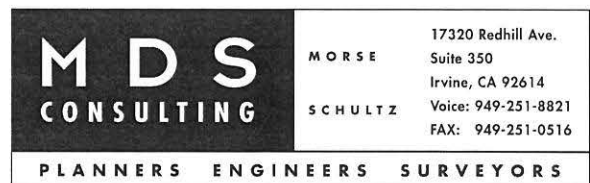
22+40	1.0660	0.03	Q				V
22+45	1.0663	0.03	Q				V
22+50	1.0665	0.03	Q				V
22+55	1.0667	0.03	Q				V
23+ 0	1.0669	0.03	Q				V
23+ 5	1.0672	0.03	Q				V
23+10	1.0674	0.03	Q				V
23+15	1.0676	0.03	Q				V
23+20	1.0678	0.03	Q				V
23+25	1.0681	0.03	Q				V
23+30	1.0683	0.03	Q				V
23+35	1.0685	0.03	Q				V
23+40	1.0687	0.03	Q				V
23+45	1.0689	0.03	Q				V
23+50	1.0692	0.03	Q				V
23+55	1.0694	0.03	Q				V
24+ 0	1.0696	0.03	Q				V
24+ 5	1.0698	0.03	Q				V
24+10	1.0700	0.03	Q				V
24+15	1.0701	0.02	Q				V
24+20	1.0702	0.02	Q				V
24+25	1.0703	0.01	Q				V
24+30	1.0704	0.01	Q				V
24+35	1.0704	0.01	Q				V
24+40	1.0705	0.01	Q				V
24+45	1.0705	0.01	Q				V
24+50	1.0705	0.00	Q				V
24+55	1.0706	0.00	Q				V
25+ 0	1.0706	0.00	Q				V
25+ 5	1.0706	0.00	Q				V
25+10	1.0706	0.00	Q				V
25+15	1.0706	0.00	Q				V
25+20	1.0706	0.00	Q				V
25+25	1.0706	0.00	Q				V
25+30	1.0707	0.00	Q				V
25+35	1.0707	0.00	Q				V
25+40	1.0707	0.00	Q				V
25+45	1.0707	0.00	Q				V
25+50	1.0707	0.00	Q				V
25+55	1.0707	0.00	Q				V
26+ 0	1.0707	0.00	Q				V
26+ 5	1.0707	0.00	Q				V
26+10	1.0707	0.00	Q				V

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# Appendix D

**UNIT HYDROGRAPH AND FLOOD  
HYDROGRAPH ROUTING CALCULATIONS -  
BASIN #1  
DEVELOPED CONDITION  
1. Q100 / 24 HR DURATION STORM**



Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012, Version 8.2  
Study date 05/05/22 File: 1Post9260024100.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 6328

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
Post Development  
100-yr / 24-hr Storm

-----  
Drainage Area = 8.02(Ac.) = 0.013 Sq. Mi.  
Drainage Area for Depth-Area Areal Adjustment = 8.02(Ac.) =  
0.013 Sq. Mi.  
USER Entry of lag time in hours  
Lag time = 0.205 Hr.  
Lag time = 12.30 Min.  
25% of lag time = 3.07 Min.  
40% of lag time = 4.92 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.02	1.96	15.72

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.02	4.83	38.74

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STORM EVENT (YEAR) = 100.00  
Area Averaged 2-Year Rainfall = 1.960(In)  
Area Averaged 100-Year Rainfall = 4.830(In)

Point rain (area averaged) = 4.830(In)  
Areal adjustment factor = 100.00 %  
Adjusted average point rain = 4.830(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
2.640	56.00	0.100
5.380	56.00	1.000
Total Area Entered = 8.02(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-3	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)
56.0	74.8	0.305	0.100	0.278	0.329	0.091
56.0	74.8	0.305	1.000	0.031	0.671	0.020
Sum (F) =						0.112

Area averaged mean soil loss (F) (In/Hr) = 0.112  
Minimum soil loss rate ((In/Hr)) = 0.056  
(for 24 hour storm duration)  
Soil low loss rate (decimal) = 0.340

Unit Hydrograph  
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	40.650	4.463
2	0.167	81.301	18.402
3	0.250	121.951	27.090
4	0.333	162.602	17.125
5	0.417	203.252	8.345
6	0.500	243.902	5.316
7	0.583	284.553	3.987
8	0.667	325.203	3.029
9	0.750	365.854	2.425
10	0.833	406.504	1.903
11	0.917	447.154	1.473
12	1.000	487.805	1.266
13	1.083	528.455	1.140
14	1.167	569.106	0.891
15	1.250	609.756	0.750
16	1.333	650.407	0.616
17	1.417	691.057	0.486
18	1.500	731.707	0.407
19	1.583	772.358	0.407
20	1.667	813.008	0.480



The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr)		Effective (In/Hr)
				Max	Low	
1	0.08	0.07	0.039	( 0.198)	0.013	0.026
2	0.17	0.07	0.039	( 0.198)	0.013	0.026
3	0.25	0.07	0.039	( 0.197)	0.013	0.026
4	0.33	0.10	0.058	( 0.196)	0.020	0.038
5	0.42	0.10	0.058	( 0.195)	0.020	0.038
6	0.50	0.10	0.058	( 0.195)	0.020	0.038
7	0.58	0.10	0.058	( 0.194)	0.020	0.038
8	0.67	0.10	0.058	( 0.193)	0.020	0.038
9	0.75	0.10	0.058	( 0.192)	0.020	0.038
10	0.83	0.13	0.077	( 0.192)	0.026	0.051
11	0.92	0.13	0.077	( 0.191)	0.026	0.051
12	1.00	0.13	0.077	( 0.190)	0.026	0.051
13	1.08	0.10	0.058	( 0.189)	0.020	0.038
14	1.17	0.10	0.058	( 0.189)	0.020	0.038
15	1.25	0.10	0.058	( 0.188)	0.020	0.038
16	1.33	0.10	0.058	( 0.187)	0.020	0.038
17	1.42	0.10	0.058	( 0.186)	0.020	0.038
18	1.50	0.10	0.058	( 0.186)	0.020	0.038
19	1.58	0.10	0.058	( 0.185)	0.020	0.038
20	1.67	0.10	0.058	( 0.184)	0.020	0.038
21	1.75	0.10	0.058	( 0.183)	0.020	0.038
22	1.83	0.13	0.077	( 0.183)	0.026	0.051
23	1.92	0.13	0.077	( 0.182)	0.026	0.051
24	2.00	0.13	0.077	( 0.181)	0.026	0.051
25	2.08	0.13	0.077	( 0.180)	0.026	0.051
26	2.17	0.13	0.077	( 0.180)	0.026	0.051
27	2.25	0.13	0.077	( 0.179)	0.026	0.051
28	2.33	0.13	0.077	( 0.178)	0.026	0.051
29	2.42	0.13	0.077	( 0.178)	0.026	0.051
30	2.50	0.13	0.077	( 0.177)	0.026	0.051
31	2.58	0.17	0.097	( 0.176)	0.033	0.064
32	2.67	0.17	0.097	( 0.175)	0.033	0.064
33	2.75	0.17	0.097	( 0.175)	0.033	0.064
34	2.83	0.17	0.097	( 0.174)	0.033	0.064
35	2.92	0.17	0.097	( 0.173)	0.033	0.064
36	3.00	0.17	0.097	( 0.172)	0.033	0.064
37	3.08	0.17	0.097	( 0.172)	0.033	0.064
38	3.17	0.17	0.097	( 0.171)	0.033	0.064
39	3.25	0.17	0.097	( 0.170)	0.033	0.064
40	3.33	0.17	0.097	( 0.170)	0.033	0.064
41	3.42	0.17	0.097	( 0.169)	0.033	0.064
42	3.50	0.17	0.097	( 0.168)	0.033	0.064
43	3.58	0.17	0.097	( 0.168)	0.033	0.064
44	3.67	0.17	0.097	( 0.167)	0.033	0.064
45	3.75	0.17	0.097	( 0.166)	0.033	0.064

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46	3.83	0.20	0.116	( 0.165)	0.039	0.077
47	3.92	0.20	0.116	( 0.165)	0.039	0.077
48	4.00	0.20	0.116	( 0.164)	0.039	0.077
49	4.08	0.20	0.116	( 0.163)	0.039	0.077
50	4.17	0.20	0.116	( 0.163)	0.039	0.077
51	4.25	0.20	0.116	( 0.162)	0.039	0.077
52	4.33	0.23	0.135	( 0.161)	0.046	0.089
53	4.42	0.23	0.135	( 0.161)	0.046	0.089
54	4.50	0.23	0.135	( 0.160)	0.046	0.089
55	4.58	0.23	0.135	( 0.159)	0.046	0.089
56	4.67	0.23	0.135	( 0.159)	0.046	0.089
57	4.75	0.23	0.135	( 0.158)	0.046	0.089
58	4.83	0.27	0.155	( 0.157)	0.053	0.102
59	4.92	0.27	0.155	( 0.156)	0.053	0.102
60	5.00	0.27	0.155	( 0.156)	0.053	0.102
61	5.08	0.20	0.116	( 0.155)	0.039	0.077
62	5.17	0.20	0.116	( 0.154)	0.039	0.077
63	5.25	0.20	0.116	( 0.154)	0.039	0.077
64	5.33	0.23	0.135	( 0.153)	0.046	0.089
65	5.42	0.23	0.135	( 0.152)	0.046	0.089
66	5.50	0.23	0.135	( 0.152)	0.046	0.089
67	5.58	0.27	0.155	( 0.151)	0.053	0.102
68	5.67	0.27	0.155	( 0.150)	0.053	0.102
69	5.75	0.27	0.155	( 0.150)	0.053	0.102
70	5.83	0.27	0.155	( 0.149)	0.053	0.102
71	5.92	0.27	0.155	( 0.148)	0.053	0.102
72	6.00	0.27	0.155	( 0.148)	0.053	0.102
73	6.08	0.30	0.174	( 0.147)	0.059	0.115
74	6.17	0.30	0.174	( 0.146)	0.059	0.115
75	6.25	0.30	0.174	( 0.146)	0.059	0.115
76	6.33	0.30	0.174	( 0.145)	0.059	0.115
77	6.42	0.30	0.174	( 0.145)	0.059	0.115
78	6.50	0.30	0.174	( 0.144)	0.059	0.115
79	6.58	0.33	0.193	( 0.143)	0.066	0.128
80	6.67	0.33	0.193	( 0.143)	0.066	0.128
81	6.75	0.33	0.193	( 0.142)	0.066	0.128
82	6.83	0.33	0.193	( 0.141)	0.066	0.128
83	6.92	0.33	0.193	( 0.141)	0.066	0.128
84	7.00	0.33	0.193	( 0.140)	0.066	0.128
85	7.08	0.33	0.193	( 0.139)	0.066	0.128
86	7.17	0.33	0.193	( 0.139)	0.066	0.128
87	7.25	0.33	0.193	( 0.138)	0.066	0.128
88	7.33	0.37	0.213	( 0.137)	0.072	0.140
89	7.42	0.37	0.213	( 0.137)	0.072	0.140
90	7.50	0.37	0.213	( 0.136)	0.072	0.140
91	7.58	0.40	0.232	( 0.136)	0.079	0.153
92	7.67	0.40	0.232	( 0.135)	0.079	0.153
93	7.75	0.40	0.232	( 0.134)	0.079	0.153
94	7.83	0.43	0.251	( 0.134)	0.085	0.166
95	7.92	0.43	0.251	( 0.133)	0.085	0.166
96	8.00	0.43	0.251	( 0.132)	0.085	0.166
97	8.08	0.50	0.290	( 0.132)	0.099	0.191
98	8.17	0.50	0.290	( 0.131)	0.099	0.191
99	8.25	0.50	0.290	( 0.131)	0.099	0.191

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100	8.33	0.50	0.290	( 0.130)	0.099	0.191
101	8.42	0.50	0.290	( 0.129)	0.099	0.191
102	8.50	0.50	0.290	( 0.129)	0.099	0.191
103	8.58	0.53	0.309	( 0.128)	0.105	0.204
104	8.67	0.53	0.309	( 0.128)	0.105	0.204
105	8.75	0.53	0.309	( 0.127)	0.105	0.204
106	8.83	0.57	0.328	( 0.126)	0.112	0.217
107	8.92	0.57	0.328	( 0.126)	0.112	0.217
108	9.00	0.57	0.328	( 0.125)	0.112	0.217
109	9.08	0.63	0.367	0.125 ( 0.125)		0.242
110	9.17	0.63	0.367	0.124 ( 0.125)		0.243
111	9.25	0.63	0.367	0.123 ( 0.125)		0.244
112	9.33	0.67	0.386	0.123 ( 0.131)		0.264
113	9.42	0.67	0.386	0.122 ( 0.131)		0.264
114	9.50	0.67	0.386	0.122 ( 0.131)		0.265
115	9.58	0.70	0.406	0.121 ( 0.138)		0.285
116	9.67	0.70	0.406	0.121 ( 0.138)		0.285
117	9.75	0.70	0.406	0.120 ( 0.138)		0.286
118	9.83	0.73	0.425	0.119 ( 0.145)		0.306
119	9.92	0.73	0.425	0.119 ( 0.145)		0.306
120	10.00	0.73	0.425	0.118 ( 0.145)		0.307
121	10.08	0.50	0.290	( 0.118)	0.099	0.191
122	10.17	0.50	0.290	( 0.117)	0.099	0.191
123	10.25	0.50	0.290	( 0.117)	0.099	0.191
124	10.33	0.50	0.290	( 0.116)	0.099	0.191
125	10.42	0.50	0.290	( 0.115)	0.099	0.191
126	10.50	0.50	0.290	( 0.115)	0.099	0.191
127	10.58	0.67	0.386	0.114 ( 0.131)		0.272
128	10.67	0.67	0.386	0.114 ( 0.131)		0.273
129	10.75	0.67	0.386	0.113 ( 0.131)		0.273
130	10.83	0.67	0.386	0.113 ( 0.131)		0.274
131	10.92	0.67	0.386	0.112 ( 0.131)		0.274
132	11.00	0.67	0.386	0.111 ( 0.131)		0.275
133	11.08	0.63	0.367	0.111 ( 0.125)		0.256
134	11.17	0.63	0.367	0.110 ( 0.125)		0.257
135	11.25	0.63	0.367	0.110 ( 0.125)		0.257
136	11.33	0.63	0.367	0.109 ( 0.125)		0.258
137	11.42	0.63	0.367	0.109 ( 0.125)		0.258
138	11.50	0.63	0.367	0.108 ( 0.125)		0.259
139	11.58	0.57	0.328	0.108 ( 0.112)		0.221
140	11.67	0.57	0.328	0.107 ( 0.112)		0.221
141	11.75	0.57	0.328	0.107 ( 0.112)		0.222
142	11.83	0.60	0.348	0.106 ( 0.118)		0.242
143	11.92	0.60	0.348	0.106 ( 0.118)		0.242
144	12.00	0.60	0.348	0.105 ( 0.118)		0.243
145	12.08	0.83	0.483	0.105 ( 0.164)		0.378
146	12.17	0.83	0.483	0.104 ( 0.164)		0.379
147	12.25	0.83	0.483	0.103 ( 0.164)		0.380
148	12.33	0.87	0.502	0.103 ( 0.171)		0.399
149	12.42	0.87	0.502	0.102 ( 0.171)		0.400
150	12.50	0.87	0.502	0.102 ( 0.171)		0.400
151	12.58	0.93	0.541	0.101 ( 0.184)		0.440
152	12.67	0.93	0.541	0.101 ( 0.184)		0.440
153	12.75	0.93	0.541	0.100 ( 0.184)		0.441

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154	12.83	0.97	0.560	0.100	( 0.190)	0.460
155	12.92	0.97	0.560	0.099	( 0.190)	0.461
156	13.00	0.97	0.560	0.099	( 0.190)	0.461
157	13.08	1.13	0.657	0.098	( 0.223)	0.559
158	13.17	1.13	0.657	0.098	( 0.223)	0.559
159	13.25	1.13	0.657	0.097	( 0.223)	0.560
160	13.33	1.13	0.657	0.097	( 0.223)	0.560
161	13.42	1.13	0.657	0.096	( 0.223)	0.560
162	13.50	1.13	0.657	0.096	( 0.223)	0.561
163	13.58	0.77	0.444	0.095	( 0.151)	0.349
164	13.67	0.77	0.444	0.095	( 0.151)	0.349
165	13.75	0.77	0.444	0.094	( 0.151)	0.350
166	13.83	0.77	0.444	0.094	( 0.151)	0.350
167	13.92	0.77	0.444	0.093	( 0.151)	0.351
168	14.00	0.77	0.444	0.093	( 0.151)	0.351
169	14.08	0.90	0.522	0.093	( 0.177)	0.429
170	14.17	0.90	0.522	0.092	( 0.177)	0.430
171	14.25	0.90	0.522	0.092	( 0.177)	0.430
172	14.33	0.87	0.502	0.091	( 0.171)	0.411
173	14.42	0.87	0.502	0.091	( 0.171)	0.412
174	14.50	0.87	0.502	0.090	( 0.171)	0.412
175	14.58	0.87	0.502	0.090	( 0.171)	0.413
176	14.67	0.87	0.502	0.089	( 0.171)	0.413
177	14.75	0.87	0.502	0.089	( 0.171)	0.414
178	14.83	0.83	0.483	0.088	( 0.164)	0.395
179	14.92	0.83	0.483	0.088	( 0.164)	0.395
180	15.00	0.83	0.483	0.087	( 0.164)	0.396
181	15.08	0.80	0.464	0.087	( 0.158)	0.377
182	15.17	0.80	0.464	0.087	( 0.158)	0.377
183	15.25	0.80	0.464	0.086	( 0.158)	0.378
184	15.33	0.77	0.444	0.086	( 0.151)	0.359
185	15.42	0.77	0.444	0.085	( 0.151)	0.359
186	15.50	0.77	0.444	0.085	( 0.151)	0.360
187	15.58	0.63	0.367	0.084	( 0.125)	0.283
188	15.67	0.63	0.367	0.084	( 0.125)	0.283
189	15.75	0.63	0.367	0.083	( 0.125)	0.284
190	15.83	0.63	0.367	0.083	( 0.125)	0.284
191	15.92	0.63	0.367	0.083	( 0.125)	0.284
192	16.00	0.63	0.367	0.082	( 0.125)	0.285
193	16.08	0.13	0.077	( 0.082)	0.026	0.051
194	16.17	0.13	0.077	( 0.081)	0.026	0.051
195	16.25	0.13	0.077	( 0.081)	0.026	0.051
196	16.33	0.13	0.077	( 0.081)	0.026	0.051
197	16.42	0.13	0.077	( 0.080)	0.026	0.051
198	16.50	0.13	0.077	( 0.080)	0.026	0.051
199	16.58	0.10	0.058	( 0.079)	0.020	0.038
200	16.67	0.10	0.058	( 0.079)	0.020	0.038
201	16.75	0.10	0.058	( 0.079)	0.020	0.038
202	16.83	0.10	0.058	( 0.078)	0.020	0.038
203	16.92	0.10	0.058	( 0.078)	0.020	0.038
204	17.00	0.10	0.058	( 0.077)	0.020	0.038
205	17.08	0.17	0.097	( 0.077)	0.033	0.064
206	17.17	0.17	0.097	( 0.077)	0.033	0.064
207	17.25	0.17	0.097	( 0.076)	0.033	0.064

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208	17.33	0.17	0.097	( 0.076)	0.033	0.064
209	17.42	0.17	0.097	( 0.075)	0.033	0.064
210	17.50	0.17	0.097	( 0.075)	0.033	0.064
211	17.58	0.17	0.097	( 0.075)	0.033	0.064
212	17.67	0.17	0.097	( 0.074)	0.033	0.064
213	17.75	0.17	0.097	( 0.074)	0.033	0.064
214	17.83	0.13	0.077	( 0.074)	0.026	0.051
215	17.92	0.13	0.077	( 0.073)	0.026	0.051
216	18.00	0.13	0.077	( 0.073)	0.026	0.051
217	18.08	0.13	0.077	( 0.072)	0.026	0.051
218	18.17	0.13	0.077	( 0.072)	0.026	0.051
219	18.25	0.13	0.077	( 0.072)	0.026	0.051
220	18.33	0.13	0.077	( 0.071)	0.026	0.051
221	18.42	0.13	0.077	( 0.071)	0.026	0.051
222	18.50	0.13	0.077	( 0.071)	0.026	0.051
223	18.58	0.10	0.058	( 0.070)	0.020	0.038
224	18.67	0.10	0.058	( 0.070)	0.020	0.038
225	18.75	0.10	0.058	( 0.070)	0.020	0.038
226	18.83	0.07	0.039	( 0.069)	0.013	0.026
227	18.92	0.07	0.039	( 0.069)	0.013	0.026
228	19.00	0.07	0.039	( 0.069)	0.013	0.026
229	19.08	0.10	0.058	( 0.068)	0.020	0.038
230	19.17	0.10	0.058	( 0.068)	0.020	0.038
231	19.25	0.10	0.058	( 0.068)	0.020	0.038
232	19.33	0.13	0.077	( 0.067)	0.026	0.051
233	19.42	0.13	0.077	( 0.067)	0.026	0.051
234	19.50	0.13	0.077	( 0.067)	0.026	0.051
235	19.58	0.10	0.058	( 0.066)	0.020	0.038
236	19.67	0.10	0.058	( 0.066)	0.020	0.038
237	19.75	0.10	0.058	( 0.066)	0.020	0.038
238	19.83	0.07	0.039	( 0.066)	0.013	0.026
239	19.92	0.07	0.039	( 0.065)	0.013	0.026
240	20.00	0.07	0.039	( 0.065)	0.013	0.026
241	20.08	0.10	0.058	( 0.065)	0.020	0.038
242	20.17	0.10	0.058	( 0.064)	0.020	0.038
243	20.25	0.10	0.058	( 0.064)	0.020	0.038
244	20.33	0.10	0.058	( 0.064)	0.020	0.038
245	20.42	0.10	0.058	( 0.064)	0.020	0.038
246	20.50	0.10	0.058	( 0.063)	0.020	0.038
247	20.58	0.10	0.058	( 0.063)	0.020	0.038
248	20.67	0.10	0.058	( 0.063)	0.020	0.038
249	20.75	0.10	0.058	( 0.063)	0.020	0.038
250	20.83	0.07	0.039	( 0.062)	0.013	0.026
251	20.92	0.07	0.039	( 0.062)	0.013	0.026
252	21.00	0.07	0.039	( 0.062)	0.013	0.026
253	21.08	0.10	0.058	( 0.062)	0.020	0.038
254	21.17	0.10	0.058	( 0.061)	0.020	0.038
255	21.25	0.10	0.058	( 0.061)	0.020	0.038
256	21.33	0.07	0.039	( 0.061)	0.013	0.026
257	21.42	0.07	0.039	( 0.061)	0.013	0.026
258	21.50	0.07	0.039	( 0.060)	0.013	0.026
259	21.58	0.10	0.058	( 0.060)	0.020	0.038
260	21.67	0.10	0.058	( 0.060)	0.020	0.038
261	21.75	0.10	0.058	( 0.060)	0.020	0.038

262	21.83	0.07	0.039	( 0.060)	0.013	0.026
263	21.92	0.07	0.039	( 0.059)	0.013	0.026
264	22.00	0.07	0.039	( 0.059)	0.013	0.026
265	22.08	0.10	0.058	( 0.059)	0.020	0.038
266	22.17	0.10	0.058	( 0.059)	0.020	0.038
267	22.25	0.10	0.058	( 0.059)	0.020	0.038
268	22.33	0.07	0.039	( 0.058)	0.013	0.026
269	22.42	0.07	0.039	( 0.058)	0.013	0.026
270	22.50	0.07	0.039	( 0.058)	0.013	0.026
271	22.58	0.07	0.039	( 0.058)	0.013	0.026
272	22.67	0.07	0.039	( 0.058)	0.013	0.026
273	22.75	0.07	0.039	( 0.058)	0.013	0.026
274	22.83	0.07	0.039	( 0.057)	0.013	0.026
275	22.92	0.07	0.039	( 0.057)	0.013	0.026
276	23.00	0.07	0.039	( 0.057)	0.013	0.026
277	23.08	0.07	0.039	( 0.057)	0.013	0.026
278	23.17	0.07	0.039	( 0.057)	0.013	0.026
279	23.25	0.07	0.039	( 0.057)	0.013	0.026
280	23.33	0.07	0.039	( 0.057)	0.013	0.026
281	23.42	0.07	0.039	( 0.056)	0.013	0.026
282	23.50	0.07	0.039	( 0.056)	0.013	0.026
283	23.58	0.07	0.039	( 0.056)	0.013	0.026
284	23.67	0.07	0.039	( 0.056)	0.013	0.026
285	23.75	0.07	0.039	( 0.056)	0.013	0.026
286	23.83	0.07	0.039	( 0.056)	0.013	0.026
287	23.92	0.07	0.039	( 0.056)	0.013	0.026
288	24.00	0.07	0.039	( 0.056)	0.013	0.026

(Loss Rate Not Used)

Sum = 100.0

Sum = 42.3

Flood volume = Effective rainfall 3.53(In)  
 times area 8.0(Ac.)/[ (In)/(Ft.) ] = 2.4(Ac.Ft)  
 Total soil loss = 1.30(In)  
 Total soil loss = 0.872(Ac.Ft)  
 Total rainfall = 4.83(In)  
 Flood volume = 102628.3 Cubic Feet  
 Total soil loss = 37983.4 Cubic Feet

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 Peak flow rate of this hydrograph = 4.326(CFS)  
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24 - 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

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 Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.01	Q				
0+10	0.0004	0.05	Q				
0+15	0.0011	0.10	Q				
0+20	0.0021	0.14	Q				
0+25	0.0033	0.18	Q				
0+30	0.0048	0.22	Q				

0+35	0.0065	0.24	Q
0+40	0.0083	0.26	VQ
0+45	0.0101	0.27	VQ
0+50	0.0121	0.28	VQ
0+55	0.0142	0.31	VQ
1+ 0	0.0165	0.34	VQ
1+ 5	0.0190	0.36	VQ
1+10	0.0214	0.35	VQ
1+15	0.0237	0.33	VQ
1+20	0.0259	0.32	VQ
1+25	0.0281	0.32	VQ
1+30	0.0302	0.31	VQ
1+35	0.0324	0.31	VQ
1+40	0.0346	0.31	VQ
1+45	0.0367	0.31	VQ
1+50	0.0389	0.32	VQ
1+55	0.0412	0.34	VQ
2+ 0	0.0437	0.36	VQ
2+ 5	0.0463	0.38	VQ
2+10	0.0490	0.39	VQ
2+15	0.0517	0.39	VQ
2+20	0.0545	0.40	VQ
2+25	0.0572	0.40	VQ
2+30	0.0600	0.40	Q
2+35	0.0628	0.41	Q
2+40	0.0658	0.43	Q
2+45	0.0690	0.46	Q
2+50	0.0722	0.48	Q
2+55	0.0756	0.49	Q
3+ 0	0.0790	0.49	Q
3+ 5	0.0824	0.50	Q
3+10	0.0859	0.50	VQ
3+15	0.0894	0.50	VQ
3+20	0.0928	0.51	VQ
3+25	0.0964	0.51	VQ
3+30	0.0999	0.51	VQ
3+35	0.1034	0.51	VQ
3+40	0.1069	0.51	VQ
3+45	0.1104	0.51	VQ
3+50	0.1140	0.52	VQ
3+55	0.1177	0.54	VQ
4+ 0	0.1216	0.57	Q
4+ 5	0.1256	0.58	Q
4+10	0.1297	0.59	Q
4+15	0.1339	0.60	Q
4+20	0.1380	0.61	Q
4+25	0.1424	0.63	Q
4+30	0.1469	0.66	Q
4+35	0.1516	0.68	Q
4+40	0.1564	0.69	Q
4+45	0.1612	0.70	Q
4+50	0.1660	0.71	Q
4+55	0.1710	0.73	Q
5+ 0	0.1763	0.76	VQ

5+ 5	0.1816	0.77	Q
5+10	0.1867	0.74	QV
5+15	0.1915	0.70	QV
5+20	0.1961	0.67	QV
5+25	0.2008	0.68	QV
5+30	0.2056	0.70	QV
5+35	0.2105	0.71	QV
5+40	0.2156	0.74	QV
5+45	0.2209	0.77	Q
5+50	0.2263	0.79	Q
5+55	0.2318	0.80	Q
6+ 0	0.2373	0.80	QV
6+ 5	0.2429	0.81	QV
6+10	0.2487	0.83	QV
6+15	0.2546	0.86	QV
6+20	0.2607	0.88	QV
6+25	0.2669	0.90	QV
6+30	0.2731	0.90	QV
6+35	0.2794	0.91	QV
6+40	0.2858	0.93	QV
6+45	0.2925	0.97	QV
6+50	0.2993	0.99	Q V
6+55	0.3061	1.00	Q V
7+ 0	0.3131	1.01	QV
7+ 5	0.3200	1.01	QV
7+10	0.3270	1.02	QV
7+15	0.3340	1.02	QV
7+20	0.3411	1.03	QV
7+25	0.3483	1.05	QV
7+30	0.3557	1.08	Q V
7+35	0.3633	1.10	Q V
7+40	0.3711	1.13	Q V
7+45	0.3791	1.16	Q V
7+50	0.3873	1.19	Q V
7+55	0.3957	1.22	Q V
8+ 0	0.4044	1.26	QV
8+ 5	0.4132	1.29	Q V
8+10	0.4225	1.34	Q V
8+15	0.4322	1.41	Q V
8+20	0.4422	1.45	Q V
8+25	0.4523	1.47	Q V
8+30	0.4626	1.49	Q V
8+35	0.4730	1.51	Q V
8+40	0.4835	1.53	Q V
8+45	0.4943	1.57	Q V
8+50	0.5053	1.60	Q V
8+55	0.5166	1.63	Q V
9+ 0	0.5280	1.67	Q V
9+ 5	0.5398	1.70	Q V
9+10	0.5519	1.75	Q V
9+15	0.5644	1.82	Q V
9+20	0.5773	1.87	Q V
9+25	0.5906	1.93	Q V
9+30	0.6043	1.99	Q V



9+35	0.6184	2.04	Q	V					
9+40	0.6328	2.10	Q	V					
9+45	0.6477	2.16	Q	V					
9+50	0.6629	2.21	Q	V					
9+55	0.6785	2.26	Q	V					
10+ 0	0.6945	2.33	Q	V					
10+ 5	0.7106	2.33	Q	V					
10+10	0.7256	2.18	Q	V					
10+15	0.7390	1.95	Q	V					
10+20	0.7514	1.80	Q	V					
10+25	0.7634	1.74	Q	V					
10+30	0.7751	1.69	Q	V					
10+35	0.7867	1.69	Q	V					
10+40	0.7991	1.79	Q	V					
10+45	0.8125	1.95	Q	V					
10+50	0.8266	2.05	Q	V					
10+55	0.8411	2.10	Q	V					
11+ 0	0.8557	2.13	Q	V					
11+ 5	0.8705	2.14	Q	V					
11+10	0.8851	2.13	Q	V					
11+15	0.8996	2.10	Q	V					
11+20	0.9140	2.09	Q	V					
11+25	0.9283	2.08	Q	V					
11+30	0.9427	2.08	Q	V					
11+35	0.9569	2.07	Q	V					
11+40	0.9708	2.01	Q	V					
11+45	0.9841	1.93	Q	V					
11+50	0.9971	1.89	Q	V					
11+55	1.0102	1.90	Q	V					
12+ 0	1.0235	1.93	Q	V					
12+ 5	1.0373	2.00	Q	V					
12+10	1.0525	2.21	Q	V					
12+15	1.0698	2.51	Q	V					
12+20	1.0885	2.71	Q	V					
12+25	1.1080	2.83	Q	V					
12+30	1.1282	2.94	Q	V					
12+35	1.1490	3.02	Q	V					
12+40	1.1706	3.13	Q	V					
12+45	1.1930	3.25	Q	V					
12+50	1.2160	3.34	Q	V					
12+55	1.2396	3.42	Q	V					
13+ 0	1.2637	3.50	Q	V					
13+ 5	1.2885	3.60	Q	V					
13+10	1.3145	3.78	Q	V					
13+15	1.3422	4.02	Q	V					
13+20	1.3710	4.18	Q	V					
13+25	1.4004	4.27	Q	V					
13+30	1.4302	4.33	Q	V					
13+35	1.4598	4.30	Q	V					
13+40	1.4875	4.02	Q	V					
13+45	1.5121	3.58	Q	V					
13+50	1.5349	3.31	Q	V					
13+55	1.5569	3.19	Q	V					
14+ 0	1.5783	3.11	Q	V					

14+ 5	1.5996	3.09		Q	V
14+10	1.6213	3.16		Q	V
14+15	1.6441	3.30		Q	V
14+20	1.6673	3.38		Q	V
14+25	1.6906	3.38		Q	V
14+30	1.7137	3.36		Q	V
14+35	1.7368	3.34		Q	V
14+40	1.7598	3.34		Q	V
14+45	1.7828	3.34		Q	V
14+50	1.8057	3.33		Q	V
14+55	1.8285	3.30		Q	V
15+ 0	1.8509	3.26		Q	V
15+ 5	1.8732	3.23		Q	V
15+10	1.8951	3.19		Q	V
15+15	1.9167	3.14		Q	V
15+20	1.9381	3.11		Q	V
15+25	1.9593	3.07		Q	V
15+30	1.9800	3.02		Q	V
15+35	2.0004	2.96		Q	V
15+40	2.0199	2.83		Q	V
15+45	2.0381	2.65		Q	V
15+50	2.0556	2.53		Q	V
15+55	2.0726	2.47		Q	V
16+ 0	2.0894	2.44		Q	V
16+ 5	2.1054	2.33		Q	V
16+10	2.1189	1.96		Q	V
16+15	2.1287	1.43	Q		V
16+20	2.1362	1.09	Q		V
16+25	2.1426	0.92	Q		V
16+30	2.1482	0.81	Q		V
16+35	2.1532	0.72	Q		V
16+40	2.1576	0.64	Q		V
16+45	2.1614	0.56	Q		V
16+50	2.1649	0.50	Q		V
16+55	2.1681	0.46	Q		V
17+ 0	2.1711	0.43	Q		V
17+ 5	2.1739	0.41	Q		V
17+10	2.1769	0.43	Q		V
17+15	2.1801	0.47	Q		V
17+20	2.1835	0.49	Q		V
17+25	2.1869	0.50	Q		V
17+30	2.1903	0.50	Q		V
17+35	2.1937	0.50	Q		V
17+40	2.1971	0.49	Q		V
17+45	2.2006	0.50	Q		V
17+50	2.2040	0.50	Q		V
17+55	2.2073	0.48	Q		V
18+ 0	2.2104	0.45	Q		V
18+ 5	2.2134	0.44	Q		V
18+10	2.2164	0.43	Q		V
18+15	2.2194	0.43	Q		V
18+20	2.2223	0.42	Q		V
18+25	2.2252	0.42	Q		V
18+30	2.2281	0.42	Q		V

18+35	2.2310	0.42	Q	V
18+40	2.2337	0.40	Q	V
18+45	2.2362	0.37	Q	V
18+50	2.2386	0.34	Q	V
18+55	2.2407	0.31	Q	V
19+ 0	2.2427	0.28	Q	V
19+ 5	2.2445	0.26	Q	V
19+10	2.2463	0.27	Q	V
19+15	2.2483	0.29	Q	V
19+20	2.2504	0.30	Q	V
19+25	2.2526	0.33	Q	V
19+30	2.2551	0.36	Q	V
19+35	2.2577	0.37	Q	V
19+40	2.2601	0.36	Q	V
19+45	2.2625	0.34	Q	V
19+50	2.2647	0.32	Q	V
19+55	2.2667	0.30	Q	V
20+ 0	2.2686	0.27	Q	V
20+ 5	2.2703	0.25	Q	V
20+10	2.2721	0.26	Q	V
20+15	2.2740	0.28	Q	V
20+20	2.2760	0.29	Q	V
20+25	2.2781	0.30	Q	V
20+30	2.2802	0.30	Q	V
20+35	2.2822	0.30	Q	V
20+40	2.2843	0.31	Q	V
20+45	2.2865	0.31	Q	V
20+50	2.2885	0.30	Q	V
20+55	2.2905	0.28	Q	V
21+ 0	2.2923	0.26	Q	V
21+ 5	2.2939	0.24	Q	V
21+10	2.2957	0.25	Q	V
21+15	2.2976	0.28	Q	V
21+20	2.2995	0.29	Q	V
21+25	2.3014	0.27	Q	V
21+30	2.3031	0.25	Q	V
21+35	2.3047	0.24	Q	V
21+40	2.3065	0.25	Q	V
21+45	2.3083	0.27	Q	V
21+50	2.3103	0.28	Q	V
21+55	2.3121	0.27	Q	V
22+ 0	2.3138	0.25	Q	V
22+ 5	2.3154	0.23	Q	V
22+10	2.3171	0.25	Q	V
22+15	2.3190	0.27	Q	V
22+20	2.3210	0.28	Q	V
22+25	2.3228	0.27	Q	V
22+30	2.3245	0.24	Q	V
22+35	2.3261	0.23	Q	V
22+40	2.3276	0.22	Q	V
22+45	2.3291	0.22	Q	V
22+50	2.3306	0.22	Q	V
22+55	2.3321	0.21	Q	V
23+ 0	2.3336	0.21	Q	V

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23+ 5	2.3350	0.21	Q				V
23+10	2.3365	0.21	Q				V
23+15	2.3379	0.21	Q				V
23+20	2.3393	0.21	Q				V
23+25	2.3408	0.21	Q				V
23+30	2.3422	0.21	Q				V
23+35	2.3436	0.21	Q				V
23+40	2.3451	0.21	Q				V
23+45	2.3465	0.21	Q				V
23+50	2.3479	0.21	Q				V
23+55	2.3493	0.21	Q				V
24+ 0	2.3508	0.21	Q				V
24+ 5	2.3521	0.20	Q				V
24+10	2.3532	0.16	Q				V
24+15	2.3539	0.10	Q				V
24+20	2.3544	0.07	Q				V
24+25	2.3547	0.05	Q				V
24+30	2.3550	0.04	Q				V
24+35	2.3552	0.03	Q				V
24+40	2.3554	0.03	Q				V
24+45	2.3555	0.02	Q				V
24+50	2.3557	0.02	Q				V
24+55	2.3557	0.01	Q				V
25+ 0	2.3558	0.01	Q				V
25+ 5	2.3559	0.01	Q				V
25+10	2.3559	0.01	Q				V
25+15	2.3560	0.00	Q				V
25+20	2.3560	0.00	Q				V
25+25	2.3560	0.00	Q				V
25+30	2.3560	0.00	Q				V
25+35	2.3560	0.00	Q				V

# CRYSTAL COVE

## Detention Basin #1 Stage/Volume/Outflow Relationship

Elev (ft)		Cummulative Volume (cu-ft)	Cummulative Volume (ac-ft)	Q out (Pump) (cfs)
7.50	90.00	5396.00	<b>0.1239</b>	3.0000
6.00	72.00	4688.00	<b>0.1076</b>	3.0000
5.00	60.00	4099.00	<b>0.0941</b>	3.0000
4.00	48.00	3311.00	<b>0.0760</b>	3.0000
3.00	36.00	2421.00	<b>0.0556</b>	3.0000
2.00	24.00	1467.00	<b>0.0337</b>	3.0000
1.00	12.00	472.00	<b>0.0108</b>	3.0000
0.00	0.00	0.00	<b>0.0000</b>	3.0000

WSE for Q100 = 7.02 ft



Note:

1. Pre developed Peak flow for 100% of Project site Q 100 yr 24hr = 3.1650 cfs
2. Post developed Peak flow Q 100 yr 24-hr = 4.326 cfs
3. Constant Pump Rate = 3.0 cfs
4. WSE for Q 100 is 7.02 ft.
5. Drawdown time is 25.66 hours



FLOOD HYDROGRAPH ROUTING PROGRAM  
Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012  
Study date: 05/05/22

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Post Development  
100-yr / 24-hr Storm  
-----

Program License Serial Number 6328  
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\*\*\*\*\* HYDROGRAPH INFORMATION \*\*\*\*\*

From study/file name: 1Post9260024100.rte

\*\*\*\*\*HYDROGRAPH DATA\*\*\*\*\*

Number of intervals = 307  
Time interval = 5.0 (Min.)  
Maximum/Peak flow rate = 4.326 (CFS)  
Total volume = 2.356 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

\*\*\*\*\*

+++++  
Process from Point/Station 0.000 to Point/Station 0.000  
\*\*\*\* RETARDING BASIN ROUTING \*\*\*\*

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User entry of depth-outflow-storage data  
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Total number of inflow hydrograph intervals = 307  
Hydrograph time unit = 5.000 (Min.)  
Initial depth in storage basin = 0.00(Ft.)  
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-----  
Initial basin depth = 0.00 (Ft.)  
Initial basin storage = 0.00 (Ac.Ft)  
Initial basin outflow = 0.00 (CFS)  
-----

-----  
Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	R1	
			(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.000	0.011	3.000	0.001	0.021
2.000	0.034	3.000	0.024	0.044
3.000	0.056	3.000	0.046	0.066
4.000	0.076	3.000	0.066	0.086
5.000	0.094	3.000	0.084	0.104
6.000	0.108	3.000	0.098	0.118
7.500	0.124	3.000	0.114	0.134

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	Depth (Ft.)				
				.0	1.1	2.16	3.24	4.33
0.083	0.01	0.00	0.000	0				0.00
0.167	0.05	0.03	0.000	0				0.01
0.250	0.10	0.07	0.000	0				0.02
0.333	0.14	0.12	0.000	OI				0.04
0.417	0.18	0.16	0.001	0				0.05
0.500	0.22	0.20	0.001	0				0.07
0.583	0.24	0.23	0.001	0				0.08
0.667	0.26	0.25	0.001	0				0.08
0.750	0.27	0.26	0.001	0				0.09
0.833	0.28	0.28	0.001	0				0.09
0.917	0.31	0.29	0.001	0				0.10
1.000	0.34	0.32	0.001	0				0.11
1.083	0.36	0.35	0.001	0				0.12
1.167	0.35	0.35	0.001	0				0.12
1.250	0.33	0.34	0.001	0				0.11
1.333	0.32	0.33	0.001	0				0.11
1.417	0.32	0.32	0.001	0				0.11
1.500	0.31	0.32	0.001	0				0.11
1.583	0.31	0.31	0.001	0				0.10
1.667	0.31	0.31	0.001	0				0.10
1.750	0.31	0.31	0.001	0				0.10
1.833	0.32	0.32	0.001	0				0.11
1.917	0.34	0.33	0.001	0				0.11
2.000	0.36	0.35	0.001	0				0.12
2.083	0.38	0.37	0.001	0				0.12
2.167	0.39	0.38	0.001	0				0.13
2.250	0.39	0.39	0.001	0				0.13
2.333	0.40	0.40	0.001	0				0.13
2.417	0.40	0.40	0.001	0				0.13
2.500	0.40	0.40	0.001	0				0.13
2.583	0.41	0.41	0.001	0				0.14
2.667	0.43	0.42	0.002	0				0.14
2.750	0.46	0.44	0.002	0				0.15
2.833	0.48	0.47	0.002	0				0.16
2.917	0.49	0.48	0.002	0				0.16



R1					
3.000	0.49	0.49	0.002	0	0.16
3.083	0.50	0.50	0.002	0	0.17
3.167	0.50	0.50	0.002	0	0.17
3.250	0.50	0.50	0.002	0	0.17
3.333	0.51	0.51	0.002	0	0.17
3.417	0.51	0.51	0.002	0	0.17
3.500	0.51	0.51	0.002	0	0.17
3.583	0.51	0.51	0.002	0	0.17
3.667	0.51	0.51	0.002	0	0.17
3.750	0.51	0.51	0.002	0	0.17
3.833	0.52	0.52	0.002	0	0.17
3.917	0.54	0.53	0.002	0	0.18
4.000	0.57	0.55	0.002	0	0.18
4.083	0.58	0.57	0.002	0	0.19
4.167	0.59	0.59	0.002	0	0.20
4.250	0.60	0.60	0.002	0	0.20
4.333	0.61	0.60	0.002	0	0.20
4.417	0.63	0.62	0.002	0	0.21
4.500	0.66	0.64	0.002	0	0.21
4.583	0.68	0.67	0.002	OI	0.22
4.667	0.69	0.68	0.003	0	0.23
4.750	0.70	0.69	0.003	0	0.23
4.833	0.71	0.70	0.003	0	0.23
4.917	0.73	0.72	0.003	0	0.24
5.000	0.76	0.74	0.003	0	0.25
5.083	0.77	0.77	0.003	0	0.26
5.167	0.74	0.76	0.003	0	0.25
5.250	0.70	0.72	0.003	0	0.24
5.333	0.67	0.68	0.003	IO	0.23
5.417	0.68	0.67	0.002	OI	0.22
5.500	0.70	0.69	0.003	0	0.23
5.583	0.71	0.71	0.003	0	0.24
5.667	0.74	0.72	0.003	0	0.24
5.750	0.77	0.75	0.003	0	0.25
5.833	0.79	0.78	0.003	0	0.26
5.917	0.80	0.79	0.003	0	0.26
6.000	0.80	0.80	0.003	0	0.27
6.083	0.81	0.81	0.003	OI	0.27
6.167	0.83	0.82	0.003	0	0.27
6.250	0.86	0.85	0.003	0	0.28
6.333	0.88	0.87	0.003	0	0.29
6.417	0.90	0.89	0.003	0	0.30
6.500	0.90	0.90	0.003	0	0.30
6.583	0.91	0.91	0.003	0	0.30
6.667	0.93	0.92	0.003	0	0.31
6.750	0.97	0.95	0.003	0	0.32
6.833	0.99	0.98	0.004	0	0.33
6.917	1.00	0.99	0.004	0	0.33
7.000	1.01	1.00	0.004	0	0.33
7.083	1.01	1.01	0.004	0	0.34
7.167	1.02	1.01	0.004	0	0.34
7.250	1.02	1.02	0.004	0	0.34
7.333	1.03	1.02	0.004	0	0.34
7.417	1.05	1.04	0.004	0	0.35

				R1		
7.500	1.08	1.06	0.004	0		0.35
7.583	1.10	1.09	0.004	0		0.36
7.667	1.13	1.11	0.004	0		0.37
7.750	1.16	1.15	0.004	0		0.38
7.833	1.19	1.18	0.004	0		0.39
7.917	1.22	1.21	0.004	OI		0.40
8.000	1.26	1.24	0.005	0		0.41
8.083	1.29	1.27	0.005	0		0.42
8.167	1.34	1.32	0.005	0		0.44
8.250	1.41	1.37	0.005	0		0.46
8.333	1.45	1.43	0.005	0		0.48
8.417	1.47	1.46	0.005	0		0.49
8.500	1.49	1.48	0.005	OI		0.49
8.583	1.51	1.50	0.005	0		0.50
8.667	1.53	1.52	0.006	0		0.51
8.750	1.57	1.55	0.006	0		0.52
8.833	1.60	1.58	0.006	0		0.53
8.917	1.63	1.61	0.006	OI		0.54
9.000	1.67	1.65	0.006	0		0.55
9.083	1.70	1.68	0.006	0		0.56
9.167	1.75	1.73	0.006	0		0.58
9.250	1.82	1.79	0.007	0		0.60
9.333	1.87	1.85	0.007	0		0.62
9.417	1.93	1.90	0.007	0		0.63
9.500	1.99	1.96	0.007	0		0.65
9.583	2.04	2.01	0.007	OI		0.67
9.667	2.10	2.07	0.008	0		0.69
9.750	2.16	2.13	0.008	0		0.71
9.833	2.21	2.18	0.008	0		0.73
9.917	2.26	2.23	0.008	0		0.74
10.000	2.33	2.29	0.008	OI		0.76
10.083	2.33	2.33	0.009	0		0.78
10.167	2.18	2.26	0.008	0		0.75
10.250	1.95	2.07	0.008	IO		0.69
10.333	1.80	1.88	0.007	0		0.63
10.417	1.74	1.77	0.006	IO		0.59
10.500	1.69	1.72	0.006	0		0.57
10.583	1.69	1.69	0.006	0		0.56
10.667	1.79	1.74	0.006	OI		0.58
10.750	1.95	1.87	0.007	OI		0.62
10.833	2.05	2.00	0.007	OI		0.67
10.917	2.10	2.07	0.008	0		0.69
11.000	2.13	2.11	0.008	0		0.70
11.083	2.14	2.13	0.008	0		0.71
11.167	2.13	2.14	0.008	0		0.71
11.250	2.10	2.12	0.008	0		0.71
11.333	2.09	2.09	0.008	0		0.70
11.417	2.08	2.08	0.008	0		0.69
11.500	2.08	2.08	0.008	0		0.69
11.583	2.07	2.08	0.008	0		0.69
11.667	2.01	2.04	0.007	IO		0.68
11.750	1.93	1.98	0.007	0		0.66
11.833	1.89	1.92	0.007	0		0.64
11.917	1.90	1.90	0.007	0		0.63

12.000	1.93	1.92	0.007		0			0.64
12.083	2.00	1.96	0.007		0			0.65
12.167	2.21	2.10	0.008		OI			0.70
12.250	2.51	2.35	0.009			OI		0.78
12.333	2.71	2.60	0.010				OI	0.87
12.417	2.83	2.76	0.010			0		0.92
12.500	2.94	2.88	0.011				0	0.96
12.583	3.02	2.98	0.011				0	0.99
12.667	3.13	3.00	0.012				OI	1.02
12.750	3.25	3.00	0.013				0 I	1.08
12.833	3.34	3.00	0.015				0 I	1.17
12.917	3.42	3.00	0.018				0   I	1.28
13.000	3.50	3.00	0.021				0   I	1.42
13.083	3.60	3.00	0.025				0   I	1.59
13.167	3.78	3.00	0.029				0   I	1.79
13.250	4.02	3.00	0.035				0   I	2.07
13.333	4.18	3.00	0.043				0   I	2.41
13.417	4.27	3.00	0.052				0   I	2.80
13.500	4.33	3.00	0.060				0   I	3.22
13.583	4.30	3.00	0.069				0   I	3.67
13.667	4.02	3.00	0.077				0   I	4.08
13.750	3.58	3.00	0.083				0   I	4.39
13.833	3.31	3.00	0.086				0 I	4.56
13.917	3.19	3.00	0.088				OI	4.65
14.000	3.11	3.00	0.089				OI	4.71
14.083	3.09	3.00	0.089				0	4.75
14.167	3.16	3.00	0.090				OI	4.79
14.250	3.30	3.00	0.092				0 I	4.88
14.333	3.38	3.00	0.094				0 I	5.01
14.417	3.38	3.00	0.097				0   I	5.20
14.500	3.36	3.00	0.099				0 I	5.38
14.583	3.34	3.00	0.102				0 I	5.56
14.667	3.34	3.00	0.104				0 I	5.72
14.750	3.34	3.00	0.106				0 I	5.89
14.833	3.33	3.00	0.109				0 I	6.08
14.917	3.30	3.00	0.111				0 I	6.28
15.000	3.26	3.00	0.113				0 I	6.46
15.083	3.23	3.00	0.115				OI	6.62
15.167	3.19	3.00	0.116				OI	6.76
15.250	3.14	3.00	0.117				OI	6.86
15.333	3.11	3.00	0.118				0	6.94
15.417	3.07	3.00	0.119				0	7.00
15.500	3.02	3.00	0.119				0	7.02
15.583	2.96	3.00	0.119				IO	7.01
15.667	2.83	3.00	0.118				I 0	6.95
15.750	2.65	3.00	0.116				I 0	6.78
15.833	2.53	3.00	0.113				I 0	6.51
15.917	2.47	3.00	0.110				I 0	6.19
16.000	2.44	3.00	0.106				I 0	5.88
16.083	2.33	3.00	0.102				I 0	5.57
16.167	1.96	3.00	0.096		I		0	5.15
16.250	1.43	3.00	0.087		I		0	4.62
16.333	1.09	3.00	0.075		I		0	3.96
16.417	0.92	3.00	0.061		I		0	3.27

				R1			
16.500	0.81	3.00	0.047	I		0	2.58
16.583	0.72	3.00	0.031	I		0	1.88
16.667	0.64	3.00	0.015	I		0	1.19
16.750	0.56	1.29	0.005	I	0		0.43
16.833	0.50	0.56	0.002	IO			0.19
16.917	0.46	0.49	0.002	O			0.16
17.000	0.43	0.45	0.002	O			0.15
17.083	0.41	0.42	0.002	O			0.14
17.167	0.43	0.42	0.002	O			0.14
17.250	0.47	0.45	0.002	O			0.15
17.333	0.49	0.48	0.002	O			0.16
17.417	0.50	0.49	0.002	O			0.16
17.500	0.50	0.50	0.002	O			0.17
17.583	0.50	0.50	0.002	O			0.17
17.667	0.49	0.50	0.002	O			0.17
17.750	0.50	0.50	0.002	O			0.17
17.833	0.50	0.50	0.002	O			0.17
17.917	0.48	0.49	0.002	O			0.16
18.000	0.45	0.47	0.002	O			0.16
18.083	0.44	0.45	0.002	O			0.15
18.167	0.43	0.44	0.002	O			0.15
18.250	0.43	0.43	0.002	O			0.14
18.333	0.42	0.43	0.002	O			0.14
18.417	0.42	0.42	0.002	O			0.14
18.500	0.42	0.42	0.002	O			0.14
18.583	0.42	0.42	0.002	O			0.14
18.667	0.40	0.41	0.001	IO			0.14
18.750	0.37	0.38	0.001	O			0.13
18.833	0.34	0.36	0.001	O			0.12
18.917	0.31	0.33	0.001	O			0.11
19.000	0.28	0.30	0.001	O			0.10
19.083	0.26	0.27	0.001	IO			0.09
19.167	0.27	0.27	0.001	O			0.09
19.250	0.29	0.28	0.001	O			0.09
19.333	0.30	0.30	0.001	O			0.10
19.417	0.33	0.32	0.001	O			0.11
19.500	0.36	0.34	0.001	O			0.11
19.583	0.37	0.36	0.001	O			0.12
19.667	0.36	0.37	0.001	O			0.12
19.750	0.34	0.35	0.001	O			0.12
19.833	0.32	0.33	0.001	O			0.11
19.917	0.30	0.31	0.001	O			0.10
20.000	0.27	0.28	0.001	IO			0.09
20.083	0.25	0.26	0.001	O			0.09
20.167	0.26	0.25	0.001	O			0.08
20.250	0.28	0.27	0.001	OI			0.09
20.333	0.29	0.29	0.001	O			0.10
20.417	0.30	0.30	0.001	O			0.10
20.500	0.30	0.30	0.001	O			0.10
20.583	0.30	0.30	0.001	O			0.10
20.667	0.31	0.30	0.001	O			0.10
20.750	0.31	0.31	0.001	O			0.10
20.833	0.30	0.30	0.001	O			0.10
20.917	0.28	0.29	0.001	O			0.10

21.000	0.26	0.27	0.001	IO					0.09
21.083	0.24	0.25	0.001	O					0.08
21.167	0.25	0.25	0.001	O					0.08
21.250	0.28	0.26	0.001	OI					0.09
21.333	0.29	0.28	0.001	O					0.09
21.417	0.27	0.28	0.001	O					0.09
21.500	0.25	0.26	0.001	O					0.09
21.583	0.24	0.24	0.001	O					0.08
21.667	0.25	0.24	0.001	O					0.08
21.750	0.27	0.26	0.001	OI					0.09
21.833	0.28	0.28	0.001	O					0.09
21.917	0.27	0.28	0.001	IO					0.09
22.000	0.25	0.26	0.001	O					0.09
22.083	0.23	0.24	0.001	O					0.08
22.167	0.25	0.24	0.001	O					0.08
22.250	0.27	0.26	0.001	OI					0.09
22.333	0.28	0.28	0.001	O					0.09
22.417	0.27	0.27	0.001	IO					0.09
22.500	0.24	0.26	0.001	O					0.09
22.583	0.23	0.24	0.001	O					0.08
22.667	0.22	0.23	0.001	O					0.08
22.750	0.22	0.22	0.001	O					0.07
22.833	0.22	0.22	0.001	O					0.07
22.917	0.21	0.22	0.001	O					0.07
23.000	0.21	0.21	0.001	O					0.07
23.083	0.21	0.21	0.001	O					0.07
23.167	0.21	0.21	0.001	O					0.07
23.250	0.21	0.21	0.001	O					0.07
23.333	0.21	0.21	0.001	O					0.07
23.417	0.21	0.21	0.001	O					0.07
23.500	0.21	0.21	0.001	O					0.07
23.583	0.21	0.21	0.001	O					0.07
23.667	0.21	0.21	0.001	O					0.07
23.750	0.21	0.21	0.001	O					0.07
23.833	0.21	0.21	0.001	O					0.07
23.917	0.21	0.21	0.001	O					0.07
24.000	0.21	0.21	0.001	O					0.07
24.083	0.20	0.20	0.001	O					0.07
24.167	0.16	0.18	0.001	O					0.06
24.250	0.10	0.13	0.000	O					0.04
24.333	0.07	0.09	0.000	O					0.03
24.417	0.05	0.06	0.000	O					0.02
24.500	0.04	0.05	0.000	O					0.02
24.583	0.03	0.04	0.000	O					0.01
24.667	0.03	0.03	0.000	O					0.01
24.750	0.02	0.02	0.000	O					0.01
24.833	0.02	0.02	0.000	O					0.01
24.917	0.01	0.01	0.000	O					0.00
25.000	0.01	0.01	0.000	O					0.00
25.083	0.01	0.01	0.000	O					0.00
25.167	0.01	0.01	0.000	O					0.00
25.250	0.00	0.01	0.000	O					0.00
25.333	0.00	0.00	0.000	O					0.00
25.417	0.00	0.00	0.000	O					0.00

					R1				
25.500	0.00	0.00	0.000	0					0.00
25.583	0.00	0.00	0.000	0					0.00
25.667	0.00	0.00	0.000	0					0.00

\*\*\*\*\*HYDROGRAPH DATA\*\*\*\*\*

Number of intervals = 308  
 Time interval = 5.0 (Min.)  
 Maximum/Peak flow rate = 3.000 (CFS)  
 Total volume = 2.356 (Ac.Ft)  
 Status of hydrographs being held in storage  
 Stream 1 Stream 2 Stream 3 Stream 4 Stream 5  
 Peak (CFS) 0.000 0.000 0.000 0.000 0.000  
 Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000

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# Appendix E

## REFERENCES

<b>M D S</b> CONSULTING	MORSE	17320 Redhill Ave. Suite 350 Irvine, CA 92614
	SCHULTZ	Voice: 949-251-8821 FAX: 949-251-0516
PLANNERS ENGINEERS SURVEYORS		



# RAINFALL INTENSITY—INCHES PER HOUR

## SUNNYMEAD - MORENO

## WOODCREST

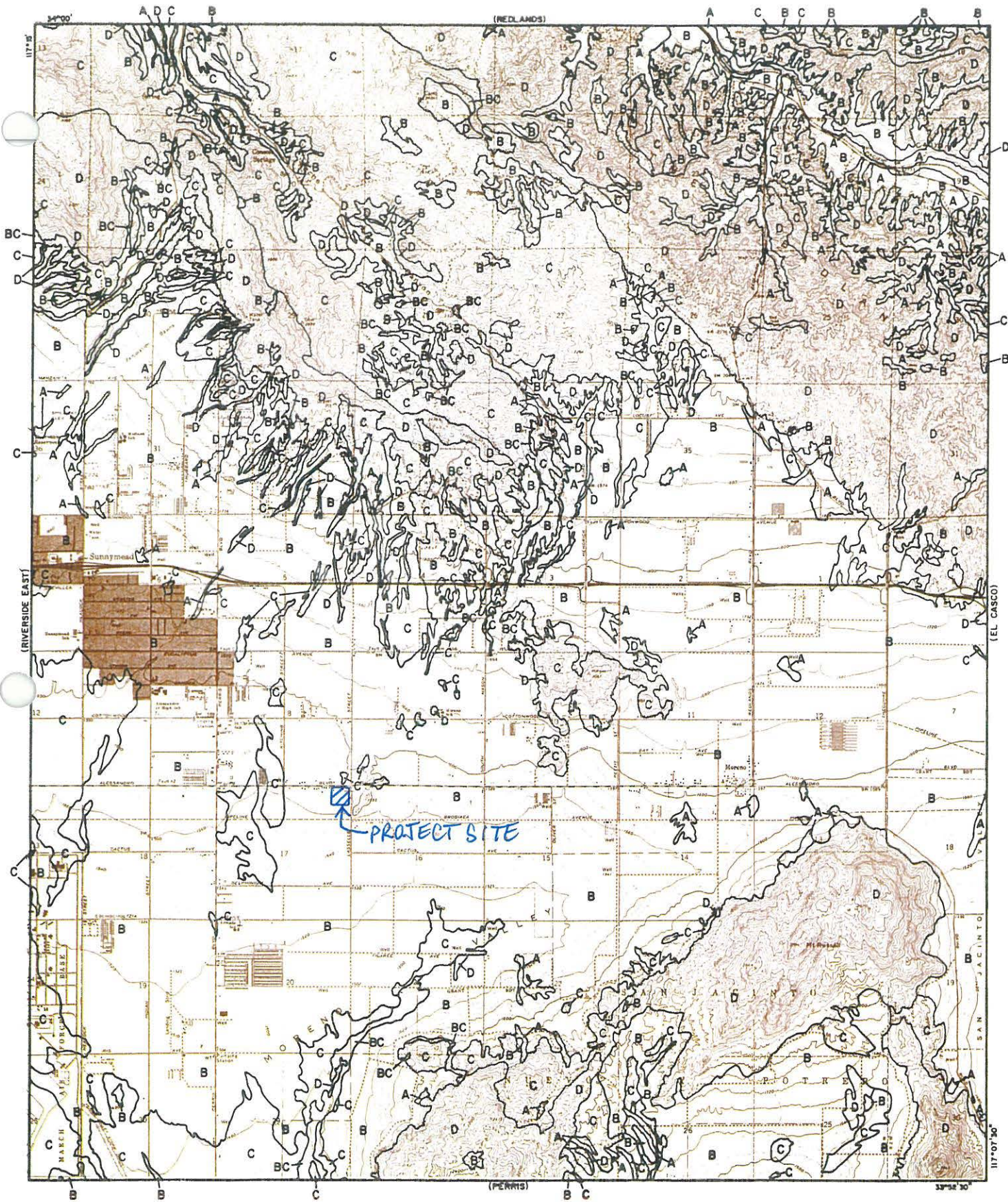
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.16	5	3.37	5.30
6	2.59	3.79	6	3.05	4.79
7	2.40	3.51	7	2.80	4.40
8	2.25	3.29	8	2.60	4.09
9	2.12	3.10	9	2.44	3.83
10	2.01	2.94	10	2.30	3.62
11	1.92	2.80	11	2.19	3.43
12	1.83	2.68	12	2.08	3.27
13	1.76	2.58	13	1.99	3.13
14	1.70	2.48	14	1.91	3.01
15	1.64	2.40	15	1.84	2.89
16	1.59	2.32	16	1.78	2.79
17	1.54	2.25	17	1.72	2.70
18	1.50	2.19	18	1.67	2.62
19	1.46	2.13	19	1.62	2.54
20	1.42	2.08	20	1.57	2.47
22	1.35	1.98	22	1.49	2.34
24	1.30	1.90	24	1.42	2.23
26	1.25	1.82	26	1.36	2.14
28	1.20	1.76	28	1.31	2.05
30	1.16	1.70	30	1.26	1.98
32	1.12	1.64	32	1.22	1.91
34	1.09	1.59	34	1.19	1.85
36	1.06	1.55	36	1.14	1.79
38	1.03	1.51	38	1.11	1.74
40	1.00	1.47	40	1.07	1.69
45	.95	1.39	45	1.01	1.58
50	.90	1.31	50	.95	1.49
55	.86	1.25	55	.90	1.42
60	.82	1.20	60	.86	1.35
65	.79	1.15	65	.82	1.29
70	.76	1.11	70	.79	1.24
75	.73	1.07	75	.76	1.19
80	.71	1.04	80	.73	1.15
85	.69	1.01	85	.71	1.11



SLOPE = .500

SLOPE = .550

**RCFC & WCD**  
 HYDROLOGY MANUAL

STANDARD  
 INTENSITY - DURATION  
 CURVES DATA



<p style="text-align: center;"><b>LEGEND</b></p> <p>— SOILS GROUP BOUNDARY</p> <p>A SOILS GROUP DESIGNATION</p> <p style="text-align: center;"><b>RCFC &amp; WCD</b></p> <p style="text-align: center;">HYDROLOGY MANUAL</p>	<p style="text-align: center;"><b>HYDROLOGIC SOILS GROUP MAP</b></p> <p style="text-align: center;"><b>FOR</b></p> <p style="text-align: center;"><b>SUNNYMEAD</b></p> <div style="text-align: center;">     <p>0 FEET 5000</p> </div>
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**NOAA Atlas 14, Volume 6, Version 2**  
**Location name: Moreno Valley, California, USA\***  
**Latitude: 33.9165°, Longitude: -117.2102°**  
**Elevation: 1574.63 ft\*\***



\* source: ESRI Maps  
 \*\* source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Tryppaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

**PF tabular**

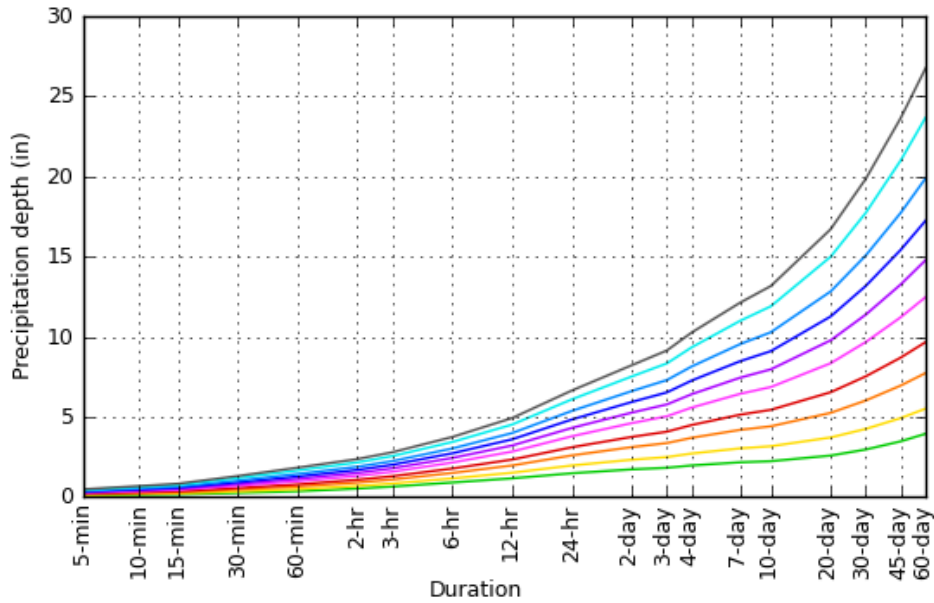
<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>0.091</b> (0.076-0.110)	<b>0.123</b> (0.103-0.149)	<b>0.166</b> (0.138-0.202)	<b>0.202</b> (0.166-0.248)	<b>0.251</b> (0.200-0.319)	<b>0.290</b> (0.226-0.376)	<b>0.329</b> (0.250-0.438)	<b>0.371</b> (0.274-0.508)	<b>0.428</b> (0.303-0.612)	<b>0.473</b> (0.323-0.701)
<b>10-min</b>	<b>0.130</b> (0.108-0.157)	<b>0.176</b> (0.147-0.214)	<b>0.238</b> (0.198-0.290)	<b>0.289</b> (0.239-0.355)	<b>0.360</b> (0.287-0.457)	<b>0.415</b> (0.323-0.538)	<b>0.472</b> (0.359-0.628)	<b>0.532</b> (0.392-0.728)	<b>0.614</b> (0.434-0.877)	<b>0.679</b> (0.463-1.00)
<b>15-min</b>	<b>0.157</b> (0.131-0.190)	<b>0.213</b> (0.178-0.259)	<b>0.288</b> (0.240-0.350)	<b>0.350</b> (0.288-0.429)	<b>0.435</b> (0.347-0.552)	<b>0.502</b> (0.391-0.651)	<b>0.571</b> (0.434-0.760)	<b>0.643</b> (0.474-0.880)	<b>0.742</b> (0.524-1.06)	<b>0.821</b> (0.559-1.22)
<b>30-min</b>	<b>0.249</b> (0.208-0.302)	<b>0.339</b> (0.282-0.411)	<b>0.458</b> (0.380-0.556)	<b>0.556</b> (0.458-0.681)	<b>0.692</b> (0.550-0.877)	<b>0.798</b> (0.621-1.03)	<b>0.907</b> (0.689-1.21)	<b>1.02</b> (0.753-1.40)	<b>1.18</b> (0.833-1.69)	<b>1.30</b> (0.889-1.93)
<b>60-min</b>	<b>0.349</b> (0.292-0.423)	<b>0.475</b> (0.396-0.575)	<b>0.641</b> (0.533-0.779)	<b>0.778</b> (0.642-0.954)	<b>0.968</b> (0.771-1.23)	<b>1.12</b> (0.870-1.45)	<b>1.27</b> (0.964-1.69)	<b>1.43</b> (1.06-1.96)	<b>1.65</b> (1.17-2.36)	<b>1.83</b> (1.24-2.70)
<b>2-hr</b>	<b>0.518</b> (0.432-0.627)	<b>0.680</b> (0.567-0.824)	<b>0.893</b> (0.743-1.09)	<b>1.07</b> (0.881-1.31)	<b>1.31</b> (1.04-1.66)	<b>1.50</b> (1.16-1.94)	<b>1.69</b> (1.28-2.24)	<b>1.88</b> (1.39-2.58)	<b>2.15</b> (1.52-3.08)	<b>2.36</b> (1.61-3.50)
<b>3-hr</b>	<b>0.642</b> (0.536-0.777)	<b>0.833</b> (0.694-1.01)	<b>1.08</b> (0.901-1.32)	<b>1.29</b> (1.06-1.58)	<b>1.57</b> (1.25-1.99)	<b>1.79</b> (1.39-2.32)	<b>2.01</b> (1.52-2.67)	<b>2.24</b> (1.65-3.06)	<b>2.55</b> (1.80-3.64)	<b>2.79</b> (1.90-4.13)
<b>6-hr</b>	<b>0.898</b> (0.750-1.09)	<b>1.16</b> (0.964-1.40)	<b>1.49</b> (1.24-1.82)	<b>1.77</b> (1.46-2.17)	<b>2.14</b> (1.71-2.72)	<b>2.43</b> (1.89-3.15)	<b>2.72</b> (2.07-3.62)	<b>3.02</b> (2.23-4.14)	<b>3.43</b> (2.42-4.90)	<b>3.74</b> (2.55-5.54)
<b>12-hr</b>	<b>1.16</b> (0.966-1.40)	<b>1.51</b> (1.26-1.83)	<b>1.96</b> (1.63-2.38)	<b>2.33</b> (1.92-2.86)	<b>2.83</b> (2.25-3.59)	<b>3.21</b> (2.50-4.16)	<b>3.59</b> (2.73-4.78)	<b>3.99</b> (2.94-5.46)	<b>4.51</b> (3.19-6.45)	<b>4.92</b> (3.36-7.29)
<b>24-hr</b>	<b>1.48</b> (1.31-1.70)	<b>1.96</b> (1.73-2.26)	<b>2.59</b> (2.28-3.00)	<b>3.10</b> (2.71-3.62)	<b>3.79</b> (3.21-4.56)	<b>4.31</b> (3.57-5.30)	<b>4.83</b> (3.92-6.09)	<b>5.37</b> (4.23-6.95)	<b>6.09</b> (4.61-8.21)	<b>6.64</b> (4.86-9.26)
<b>2-day</b>	<b>1.72</b> (1.52-1.98)	<b>2.32</b> (2.05-2.68)	<b>3.11</b> (2.74-3.60)	<b>3.75</b> (3.28-4.37)	<b>4.61</b> (3.90-5.55)	<b>5.26</b> (4.37-6.47)	<b>5.93</b> (4.80-7.46)	<b>6.60</b> (5.21-8.55)	<b>7.52</b> (5.69-10.1)	<b>8.22</b> (6.02-11.5)
<b>3-day</b>	<b>1.82</b> (1.61-2.10)	<b>2.48</b> (2.20-2.87)	<b>3.36</b> (2.96-3.89)	<b>4.07</b> (3.56-4.75)	<b>5.03</b> (4.26-6.07)	<b>5.77</b> (4.79-7.10)	<b>6.52</b> (5.28-8.21)	<b>7.29</b> (5.75-9.44)	<b>8.33</b> (6.31-11.2)	<b>9.14</b> (6.69-12.7)
<b>4-day</b>	<b>1.96</b> (1.74-2.27)	<b>2.71</b> (2.39-3.13)	<b>3.69</b> (3.25-4.27)	<b>4.49</b> (3.92-5.24)	<b>5.57</b> (4.72-6.72)	<b>6.41</b> (5.32-7.89)	<b>7.26</b> (5.88-9.15)	<b>8.14</b> (6.42-10.5)	<b>9.34</b> (7.07-12.6)	<b>10.3</b> (7.51-14.3)
<b>7-day</b>	<b>2.16</b> (1.91-2.49)	<b>3.03</b> (2.68-3.50)	<b>4.18</b> (3.69-4.84)	<b>5.13</b> (4.49-5.99)	<b>6.43</b> (5.45-7.75)	<b>7.44</b> (6.17-9.15)	<b>8.47</b> (6.86-10.7)	<b>9.53</b> (7.52-12.3)	<b>11.0</b> (8.32-14.8)	<b>12.1</b> (8.87-16.9)
<b>10-day</b>	<b>2.23</b> (1.97-2.57)	<b>3.16</b> (2.79-3.65)	<b>4.41</b> (3.88-5.10)	<b>5.44</b> (4.75-6.34)	<b>6.86</b> (5.81-8.26)	<b>7.96</b> (6.61-9.79)	<b>9.10</b> (7.37-11.5)	<b>10.3</b> (8.10-13.3)	<b>11.9</b> (9.01-16.0)	<b>13.2</b> (9.64-18.3)
<b>20-day</b>	<b>2.58</b> (2.28-2.98)	<b>3.71</b> (3.28-4.28)	<b>5.25</b> (4.62-6.07)	<b>6.53</b> (5.71-7.62)	<b>8.34</b> (7.06-10.1)	<b>9.77</b> (8.11-12.0)	<b>11.3</b> (9.12-14.2)	<b>12.8</b> (10.1-16.6)	<b>15.0</b> (11.4-20.2)	<b>16.7</b> (12.2-23.3)
<b>30-day</b>	<b>2.96</b> (2.62-3.41)	<b>4.24</b> (3.75-4.90)	<b>6.02</b> (5.30-6.97)	<b>7.52</b> (6.58-8.78)	<b>9.66</b> (8.18-11.6)	<b>11.4</b> (9.44-14.0)	<b>13.2</b> (10.7-16.6)	<b>15.1</b> (11.9-19.5)	<b>17.7</b> (13.4-23.9)	<b>19.8</b> (14.5-27.7)
<b>45-day</b>	<b>3.47</b> (3.07-4.00)	<b>4.92</b> (4.35-5.68)	<b>6.95</b> (6.13-8.04)	<b>8.70</b> (7.60-10.1)	<b>11.2</b> (9.50-13.5)	<b>13.3</b> (11.0-16.3)	<b>15.4</b> (12.5-19.4)	<b>17.7</b> (14.0-22.9)	<b>21.0</b> (15.9-28.3)	<b>23.6</b> (17.3-33.0)
<b>60-day</b>	<b>3.94</b> (3.49-4.54)	<b>5.51</b> (4.87-6.36)	<b>7.73</b> (6.81-8.95)	<b>9.66</b> (8.45-11.3)	<b>12.5</b> (10.6-15.0)	<b>14.8</b> (12.3-18.2)	<b>17.2</b> (14.0-21.7)	<b>19.9</b> (15.7-25.7)	<b>23.7</b> (17.9-31.9)	<b>26.8</b> (19.6-37.3)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

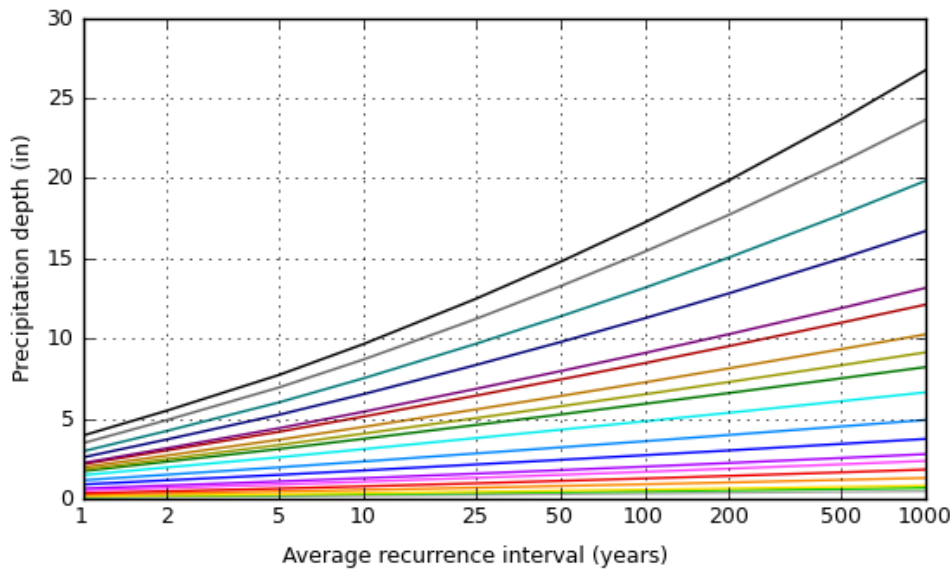
[Back to Top](#)

### PF graphical

PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 33.9165°, Longitude: -117.2102°



Average recurrence interval (years)	
1	Green
2	Yellow
5	Orange
10	Red
25	Pink
50	Purple
100	Blue
200	Cyan
500	Light Blue
1000	Black

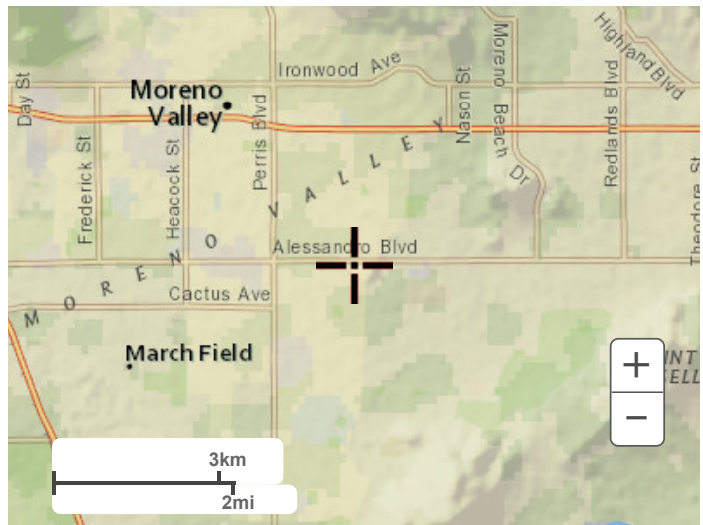


Duration	
5-min	Green
10-min	Yellow
15-min	Orange
30-min	Red
60-min	Pink
2-hr	Purple
3-hr	Blue
6-hr	Cyan
12-hr	Light Blue
24-hr	Black
2-day	Dark Green
3-day	Dark Yellow
4-day	Dark Orange
7-day	Dark Red
10-day	Dark Pink
20-day	Dark Blue
30-day	Dark Cyan
45-day	Dark Light Blue
60-day	Dark Black

[Back to Top](#)

### Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



[Back to Top](#)

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[US Department of Commerce](#)  
[National Oceanic and Atmospheric Administration](#)  
[National Weather Service](#)  
[National Water Center](#)  
1325 East West Highway  
Silver Spring, MD 20910  
Questions?: [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

[Disclaimer](#)



# Appendix F

## REFERENCE OFFSITE STORM DRAIN PLANS

### 1. LASSELLE STREET STORM DRAIN PLANS PROJECT NO. 06-50182725

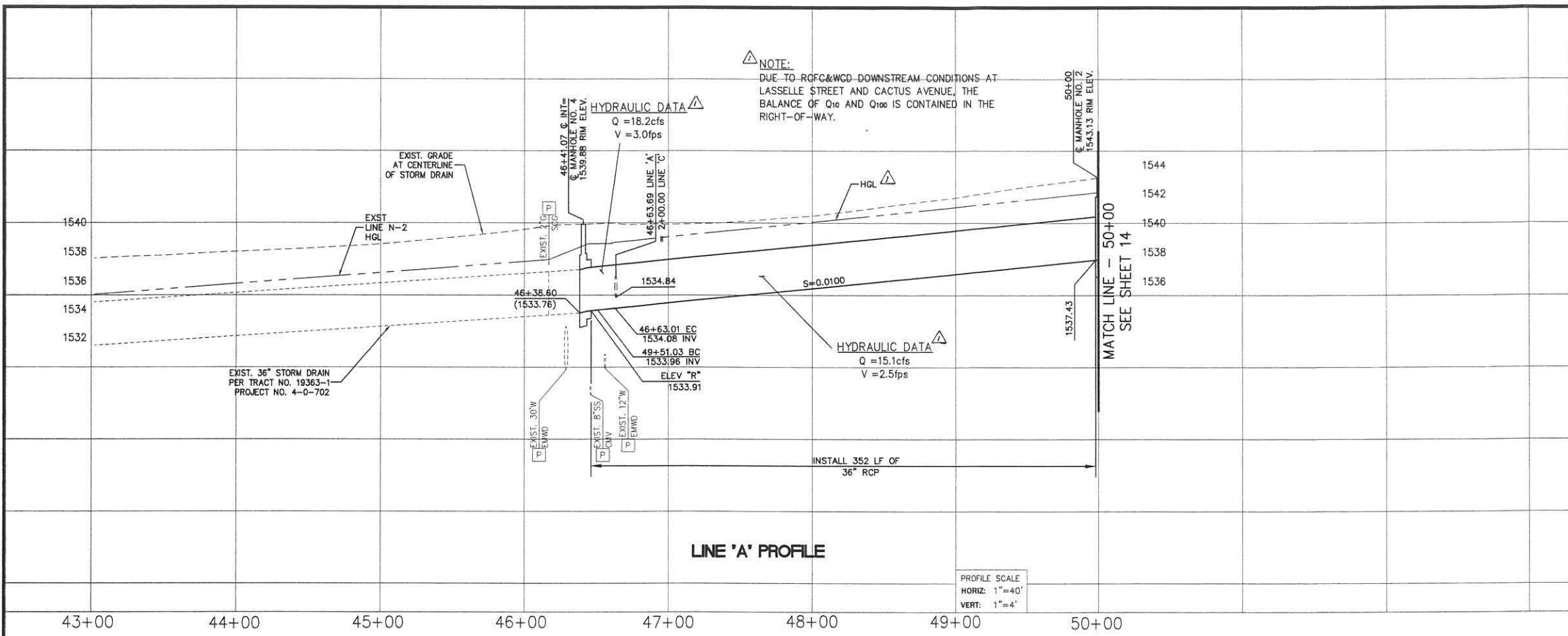
**M D S**  
CONSULTING

MORSE  
SCHULTZ

17320 Redhill Ave.  
Suite 350  
Irvine, CA 92614  
Voice: 949-251-8821  
FAX: 949-251-0516

PLANNERS ENGINEERS SURVEYORS





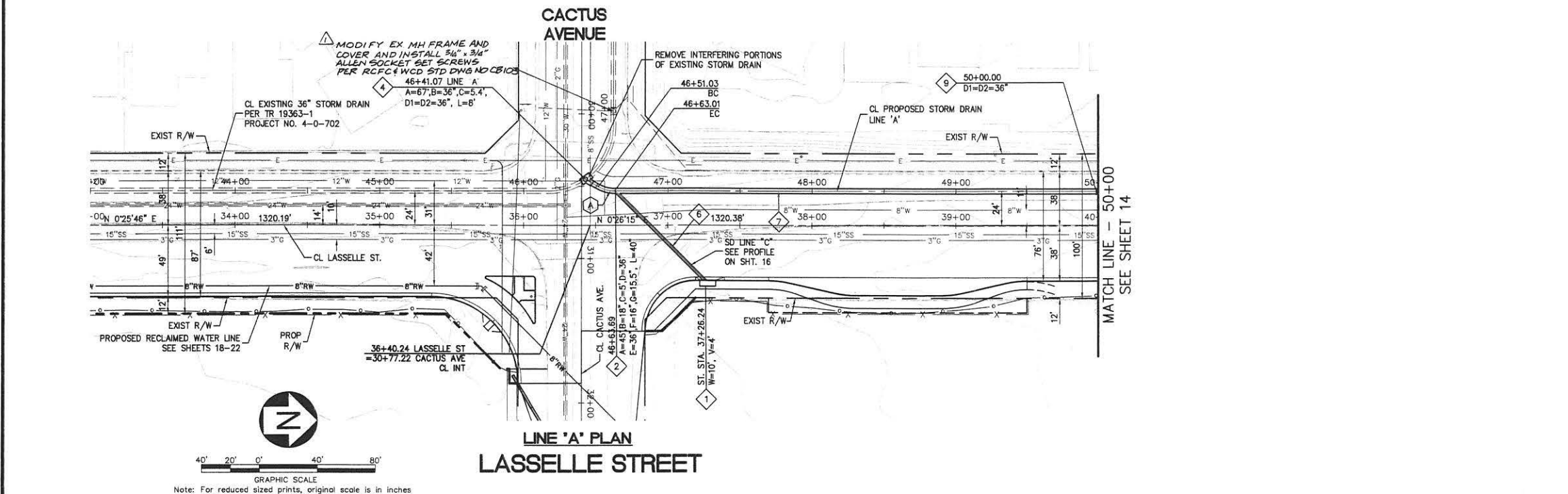
- CONSTRUCTION NOTES:**
- 1 CONSTRUCT CATCH BASIN NO. 1 PER R.C.F.C.&W.C.D. STD. DWG. NO. CB100.
  - 2 CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. JS227.
  - 4 CONSTRUCT MANHOLE NO. 4 PER R.C.F.C.&W.C.D. STD. DWG. NO. MH254 MODIFIED WITH PRESSURE TYPE MANHOLE FRAME AND COVER AND PRESSURE MANHOLE SHAFT PER R.C.F.C.&W.C.D. STD. DWG. NOS. MH256 AND MH258.
  - 6 CONSTRUCT 18" R.C.P. (D-2000)
  - 7 CONSTRUCT 36" R.C.P. (D-1500)
  - 9 CONSTRUCT MANHOLE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. MH252.

- HATCH / LINE LEGEND**
- E — EXISTING ELECTRICAL
  - FO — EXISTING FIBER OPTIC
  - G — EXISTING GAS
  - SD — EXISTING STORM DRAIN
  - RW — PROPOSED RECLAIMED WATER LINE
  - SS — EXISTING SANITARY SEWER
  - T — EXISTING TELECOMMUNICATION
  - W — EXISTING WATER

- DISPOSITION NOTES**
- P PROTECT IN PLACE (ITEM AS INDICATED)
  - RO RELOCATE BY OTHERS (ITEM AS INDICATED)

**LINE / CURVE TABLE**

#	DELTA/BRG	RADIUS	LENGTH	TANGENT
A	29°59'35"	22.50'	11.78'	6.03'



**NOTE TO CONTRACTOR:**  
 LOCATION, TYPE, AND DEPTH OF EXISTING UTILITIES INCLUDING UTILITIES IDENTIFIED WITH POT HOLE DATA ARE APPROXIMATE. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF EXCAVATION. CONTRACTOR SHALL TAKE CARE DURING EXCAVATION AND PROTECT IN PLACE ALL UTILITIES ENCOUNTERED. DAMAGED UTILITY FACILITIES SHALL BE REPAIRED AT NO ADDITIONAL COST.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.  
 Underground Service Alert  
 Call: TOLL FREE  
 1-800-227-2600  
 TWO WORKING DAYS BEFORE YOU DIG

<b>BENCH MARK</b> BM NO. M-40-4 NAVD88 ELEV: 1540.836 FEET ADJ. YEAR: RCFCD FIELD NOTES DATED 4/25/2001 FOUND 3" BRASS DISK STAMPED "M-40-4 RESET 1978" IN CONC. AT SE CORNER OF ALESSANDRO BLVD AND HASON STREET IN MORENO VALLEY, CA. POINT IS LOCATED APPROXIMATELY 56 FEET EAST OF CL OF HASON STREET AND APPROXIMATELY 48 FEET SOUTH OF CL OF ALESSANDRO BLVD.	<b>BASIS OF BEARING</b> THE BASIS OF BEARING FOR THIS SURVEY IS THE NORTH AMERICAN DATUM OF 1983 (NAD83 CORSE). CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE 8, BASED LOCALLY BETWEEN CORS STATIONS "DILL" (NGS PID #F9886) AND "CLAR" (NGS PID #A4481) BEING N44°41'21"W.
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MARK	REVISION	APPROX DATE
△	REV. HYD. DATA & HGL. ADD MH NOTE	12/11/08

**CITY OF MORENO VALLEY APPROVALS**

APPROVED BY	DATE	BY
SUPERVISING SENIOR ENGINEER	8/28/08	PK
CITY TRAFFIC ENGINEER		EL
MAINTENANCE AND OPERATIONS MANAGER	8/28/08	JW
SENIOR ENGINEER		MDK

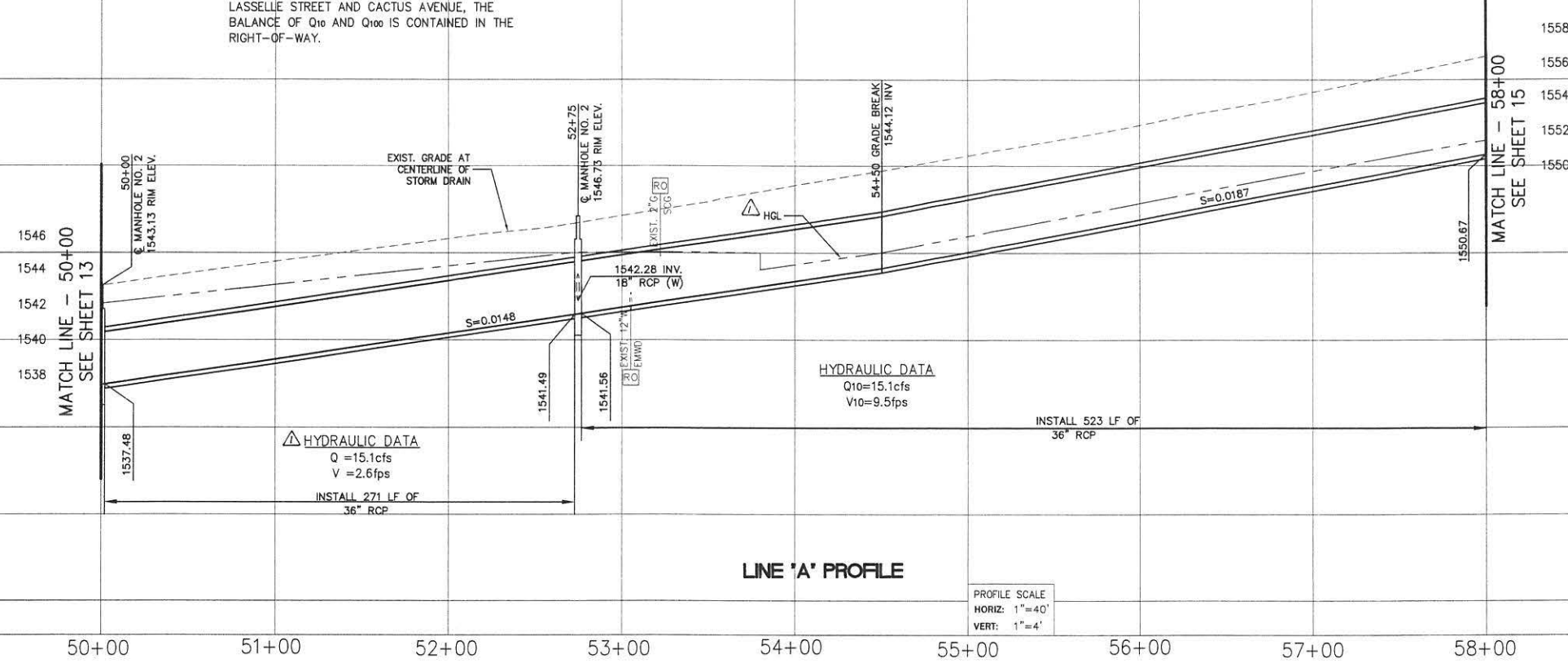
PREPARED BY: **PSOMAS**  
 3187 Red Hill Avenue, Suite 250  
 Costa Mesa, CA 92626  
 (714) 751-7373 Fax (714) 545-8883  
 UNDER THE SUPERVISION OF:  
 NANCY BOYER, PE 068531, EXP 09/30/08

**CITY OF MORENO VALLEY**  
 LASSELLE STREET  
 STORM DRAIN IMPROVEMENT PLANS  
 STA. 43+00 TO STA. 50+00

ACCT. NO. 501.82725  
 SHEET **13** NO. **43**  
 PROJECT NO. 06-50182725

DWG Name: M:\MOR1502000\Eng\Plan Sheets\SD-04.dwg Plotted by: ifrench on Dec 05, 2008 - 9:17:47

**NOTE:**  
 DUE TO RCF&WCD-DOWNSTREAM CONDITIONS AT LASSELLE STREET AND CACTUS AVENUE, THE BALANCE OF Q10 AND Q100 IS CONTAINED IN THE RIGHT-OF-WAY.

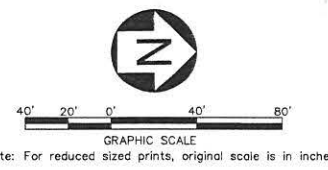
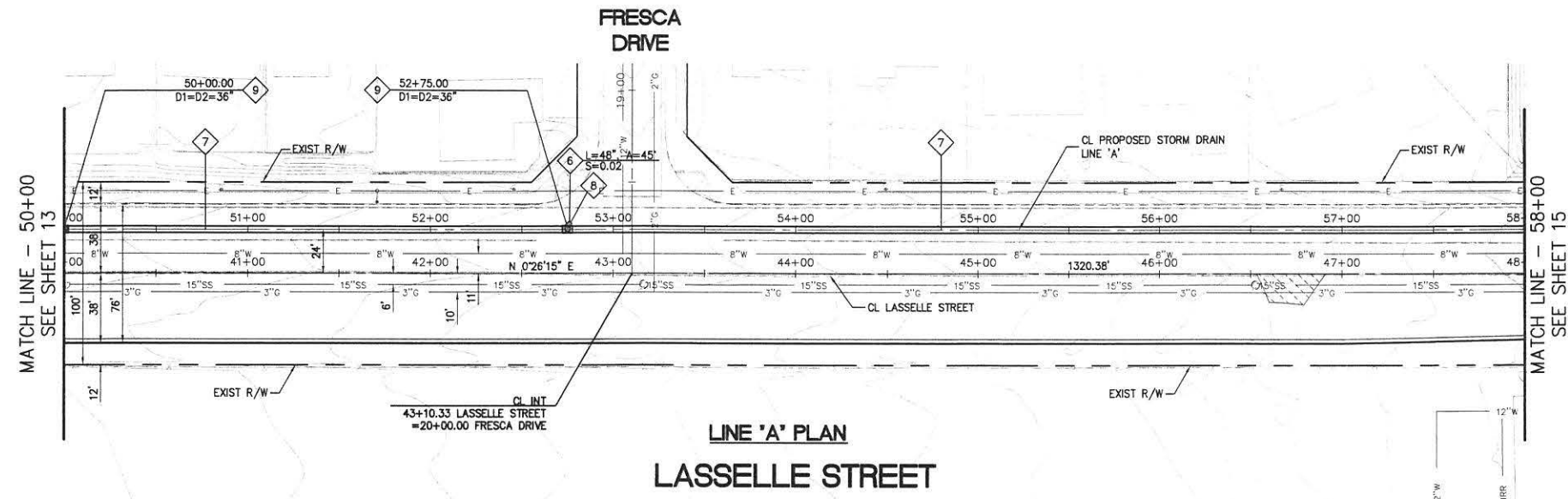


- CONSTRUCTION NOTES:**
- 6 CONSTRUCT 18" R.C.P. (D-2000)
  - 7 CONSTRUCT 36" R.C.P. (D-1500)
  - 8 CONSTRUCT CONCRETE BULKHEAD PER R.C.F.&W.C.D. STD. DWG. NO. MB16.
  - 9 CONSTRUCT MANHOLE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. MH252.

- HATCH / LINE LEGEND**
- E — EXISTING ELECTRICAL
  - FO — EXISTING FIBER OPTIC
  - G — EXISTING GAS
  - SD — EXISTING STORM DRAIN
  - SS — EXISTING SANITARY SEWER
  - T — EXISTING TELECOMMUNICATION
  - W — EXISTING WATER

**DISPOSITION NOTES**

RO RELOCATE BY OTHERS (ITEM AS INDICATED)



**NOTE TO CONTRACTOR:**  
 LOCATION, TYPE, AND DEPTH OF EXISTING UTILITIES INCLUDING UTILITIES IDENTIFIED WITH POTHOLE DATA ARE APPROXIMATE. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF EXCAVATION. CONTRACTOR SHALL TAKE CARE DURING EXCAVATION AND PROTECT IN PLACE ALL UTILITIES ENCOUNTERED. DAMAGED UTILITY FACILITIES SHALL BE REPAIRED AT NO ADDITIONAL COST.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.

**Underground Service Alert**  
 Call: TOLL FREE  
 1-800-227-2600

TWO WORKING DAYS BEFORE YOU DIG

**BENCH MARK**  
 BM NO. M-40-4  
 NAVD83 ELEV: 1590.938 FEET  
 ADJ. YEAR: RCF&WCD FIELD NOTES DATED 4/25/2001

FOUND 3" BRASS DISK STAMPED "M-40-4 RESET 1976" IN CONC. AT SE CORNER OF ALESSANDRO BLVD. AND NASON STREET IN MORENO VALLEY, CA. POINT IS LOCATED APPROXIMATELY 56 FEET EAST OF CL OF NASON STREET AND APPROXIMATELY 46 FEET SOUTH OF CL OF ALESSANDRO BLVD.

**BASIS OF BEARING**  
 THE BASIS OF BEARING FOR THIS SURVEY IS THE NORTH AMERICAN DATUM OF 1983 (NAD83, CORS96), CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE 6, BASED LOCALLY BETWEEN CORNERS STATIONS "BULL" (NCS PID AF1686) AND "CLARK" (NCS PID A14401) BEING N44°41'21"W.

MARK	REVISION	APPR DATE
△	REV. HYD. DATA & HGL	

DESIGNED BY \_\_\_\_\_ DRAWN BY \_\_\_\_\_ CHECKED BY \_\_\_\_\_

**CITY OF MORENO VALLEY APPROVALS**

APPROVED BY	DATE	BY
SUPERVISING SENIOR ENGINEER	1/24/08	KS
CITY TRAFFIC ENGINEER	8/28/08	EL
MAINTENANCE AND OPERATIONS MANAGER	9/28/08	SRW
SENIOR ENGINEER	10/28/08	ARJ

APPROVED BY: *Chris A. Vogt* DATE: 12/11/08  
 PUBLIC WORKS DIRECTOR/CITY ENGINEER  
 P.E. 44250 EXP. 06/30/2009

PLANS PREPARED BY:  
**PSOMAS**  
 3187 Red Hill Avenue Suite 250  
 Costa Mesa, CA 92626  
 (714) 751-7373 Fax (714) 545-8883

UNDER THE SUPERVISION OF:  
*Nancy L. Boyer*  
 NANCY BOYER, P.E. C68531, EXP 05/30/09



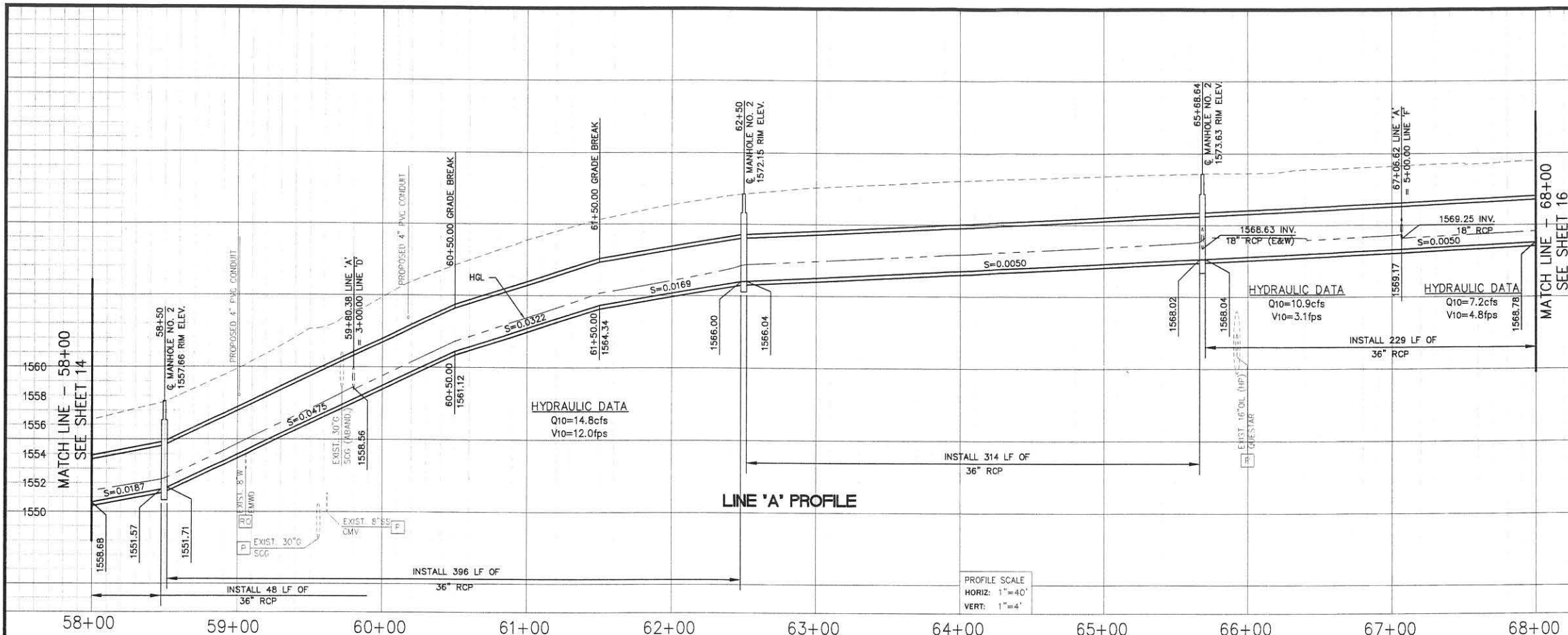
**CITY OF MORENO VALLEY**

LASSELLE STREET  
 STORM DRAIN IMPROVEMENT PLANS  
 STA. 50+00 TO STA. 58+00

ACCT. NO. 501.82725

SHEET **14** NO. **43**

PROJECT NO. 06-50182725



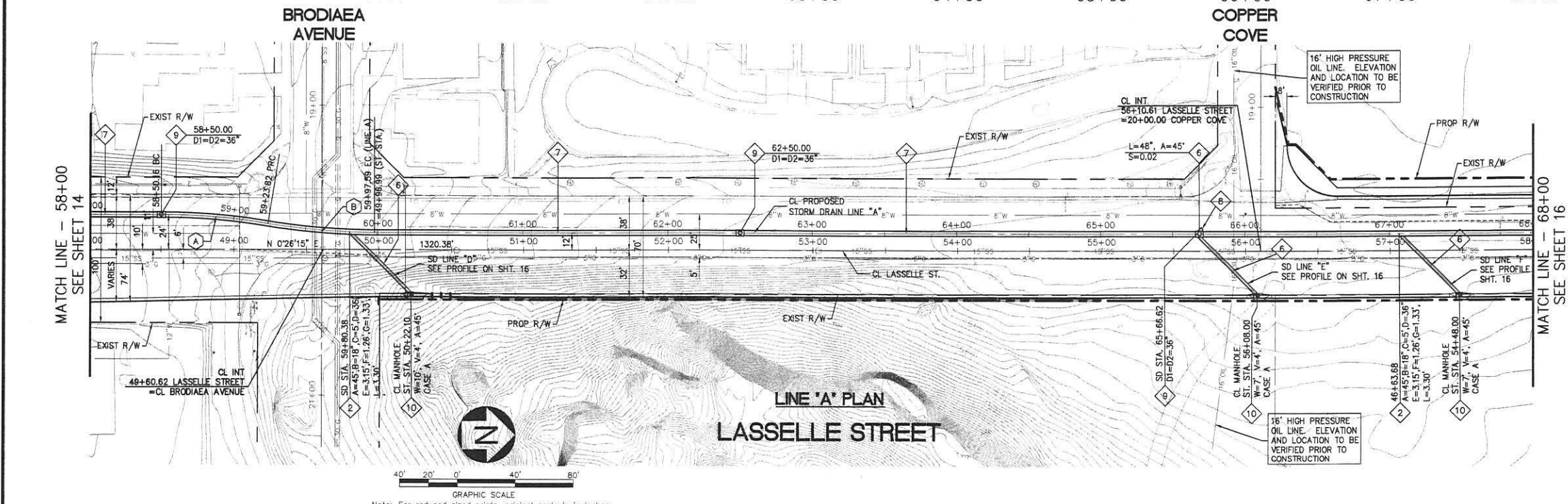
- CONSTRUCTION NOTES:**
- 1 CONSTRUCT CATCH BASIN NO. 1 PER R.C.F.C.&W.C.D. STD. DWG. NO. CB100.
  - 2 CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. JS227.
  - 6 CONSTRUCT 18" R.C.P. (D=2000)
  - 7 CONSTRUCT 36" R.C.P. (D=1500)
  - 8 CONSTRUCT CONCRETE BULKHEAD PER R.C.F.C.&W.C.D. STD. DWG. NO. MB16.
  - 9 CONSTRUCT MANHOLE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. MH252.
  - 10 CONSTRUCT CURB OPENING CATCH BASIN WITH MANHOLE IN STREET PER S.P.W.C. STD. PLAN NO. 307-2.

- HATCH / LINE LEGEND**
- E — EXISTING ELECTRICAL
  - SS — EXISTING SANITARY SEWER
  - FO — EXISTING FIBER OPTIC
  - T — EXISTING TELECOMMUNICATION
  - G — EXISTING GAS
  - W — EXISTING WATER
  - SD — EXISTING STORM DRAIN

- DISPOSITION NOTES**
- RL RELOCATE (ITEM AS INDICATED)
  - P PROTECT IN PLACE (ITEM AS INDICATED)

**LINE / CURVE TABLE**

#	DELTA/BRG	RADIUS	LENGTH	TANGENT
A	08°20'44"	451.50'	73.65'	36.90'
B	08°21'33"	451.00'	73.76'	73.67'



**NOTE TO CONTRACTOR:**  
 LOCATION, TYPE, AND DEPTH OF EXISTING UTILITIES INCLUDING UTILITIES IDENTIFIED WITH POTHOLE DATA ARE APPROXIMATE. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF EXCAVATION. CONTRACTOR SHALL TAKE CARE DURING EXCAVATION AND PROTECT IN PLACE ALL UTILITIES ENCOUNTERED. DAMAGED UTILITY FACILITIES SHALL BE REPAIRED AT NO ADDITIONAL COST.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.  
 Underground Service Alert  
 Call: TOLL FREE  
 1-800-227-2600  
 TWO WORKING DAYS BEFORE YOU DIG

**BENCH MARK**  
 BM NO. M-40-4  
 NAVD88 ELEV. 1590.938 FEET  
 ALL YEAR RCP/O FIELD NOTES DATED 4/25/2001  
 FOUND 3" BRASS DISK STAMPED "M-40-4 RESET 1976" IN CONC. AT SE CORNER OF ALESSANDRO BLVD AND HASON STREET IN MORENO VALLEY, CA. POINT IS LOCATED APPROXIMATELY 56 FEET EAST OF CL OF HASON STREET AND APPROXIMATELY 48 FEET SOUTH OF CL OF ALESSANDRO BLVD.

**BASIS OF BEARING**  
 THE BASIS OF BEARING FOR THIS SURVEY IS THE NORTH AMERICAN DATUM OF 1983 (NAD83) COORDINATE SYSTEM OF 1983 (CCS83). ZONE 6, BASED LOCALLY BETWEEN CORNERS STATIONS "BULL" (NGS PID #19886) AND "CLAR" (NGS PID #14481) BEING N44°41'21"W.

MARK	REVISION	APPR DATE

DESIGNED BY \_\_\_\_\_ DRAWN BY \_\_\_\_\_ CHECKED BY \_\_\_\_\_

**CITY OF MORENO VALLEY APPROVALS**

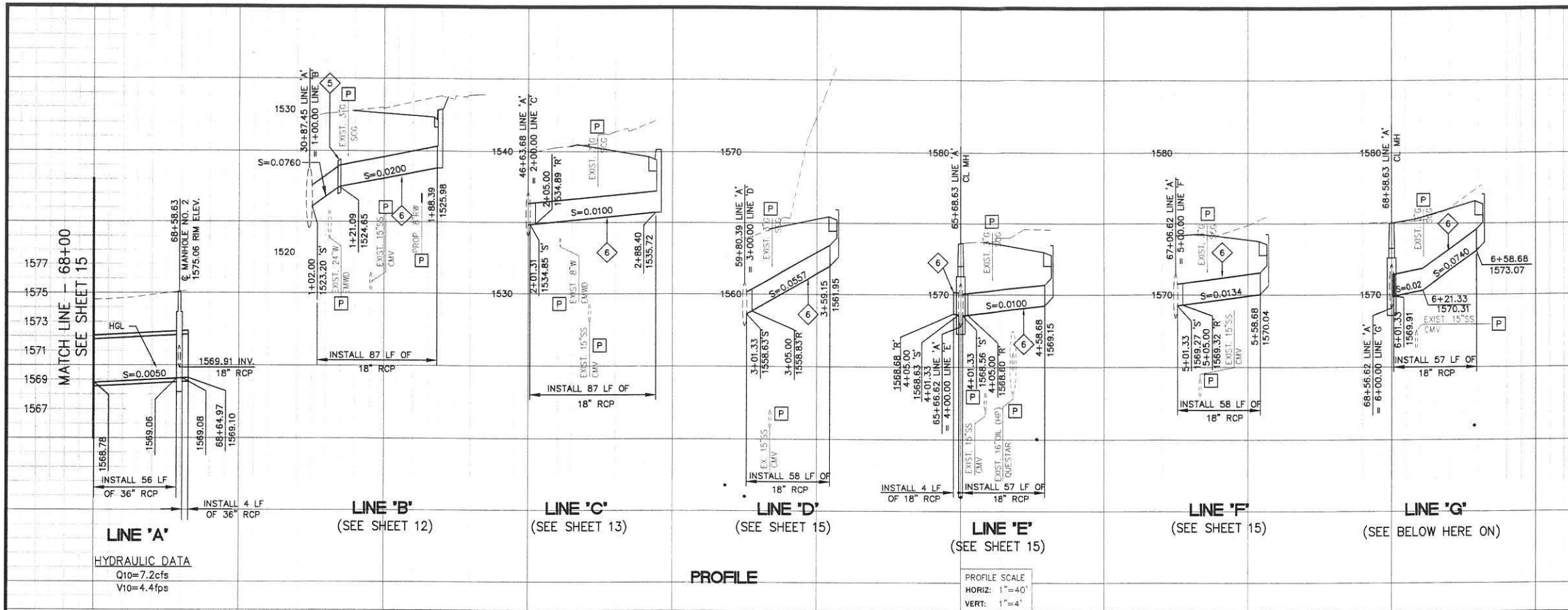
APPROVED BY	DATE	BY
SUPERVISING SENIOR ENGINEER	8/28/08	CS
CITY TRAFFIC ENGINEER	8/28/08	EL
MAINTENANCE AND OPERATIONS MANAGER	8/28/08	YU
SENIOR ENGINEER	8/28/08	AD

APPROVED BY: *Chris A. Vogt*  
 DEPUTY PUBLIC WORKS DIRECTOR / ASSISTANT CITY ENGINEER  
 R.C.E. 52463 EXP. 12/31/2008  
 DATE: 8/28/08

**PLANS PREPARED BY:**  
**PSOMAS**  
 3187 Red Hill Avenue, Suite 250  
 Costa Mesa, CA 92626  
 (714) 751-7373 Fax (714) 545-8883  
 UNDER THE SUPERVISION OF:  
*Nancy Boyer*  
 NANCY BOYER, P.E. C65531 EXP 09/30/09  
 CIVIL ENGINEER  
 STATE OF CALIFORNIA

**CITY OF MORENO VALLEY**  
 LASSELIE STREET  
 STORM DRAIN IMPROVEMENT PLANS  
 STA. 58+00 TO STA. 68+00

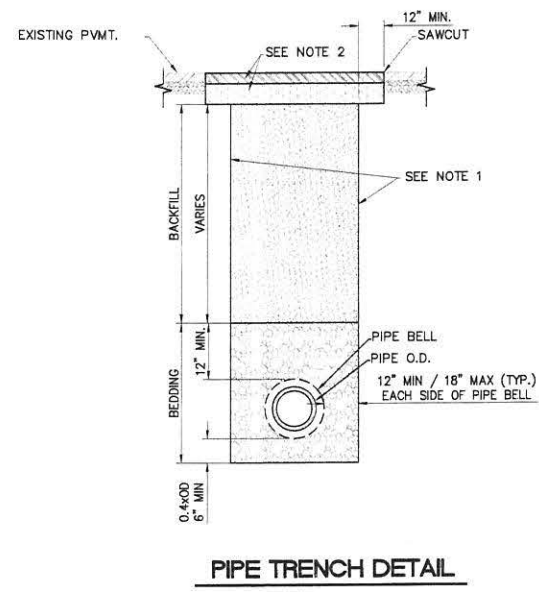
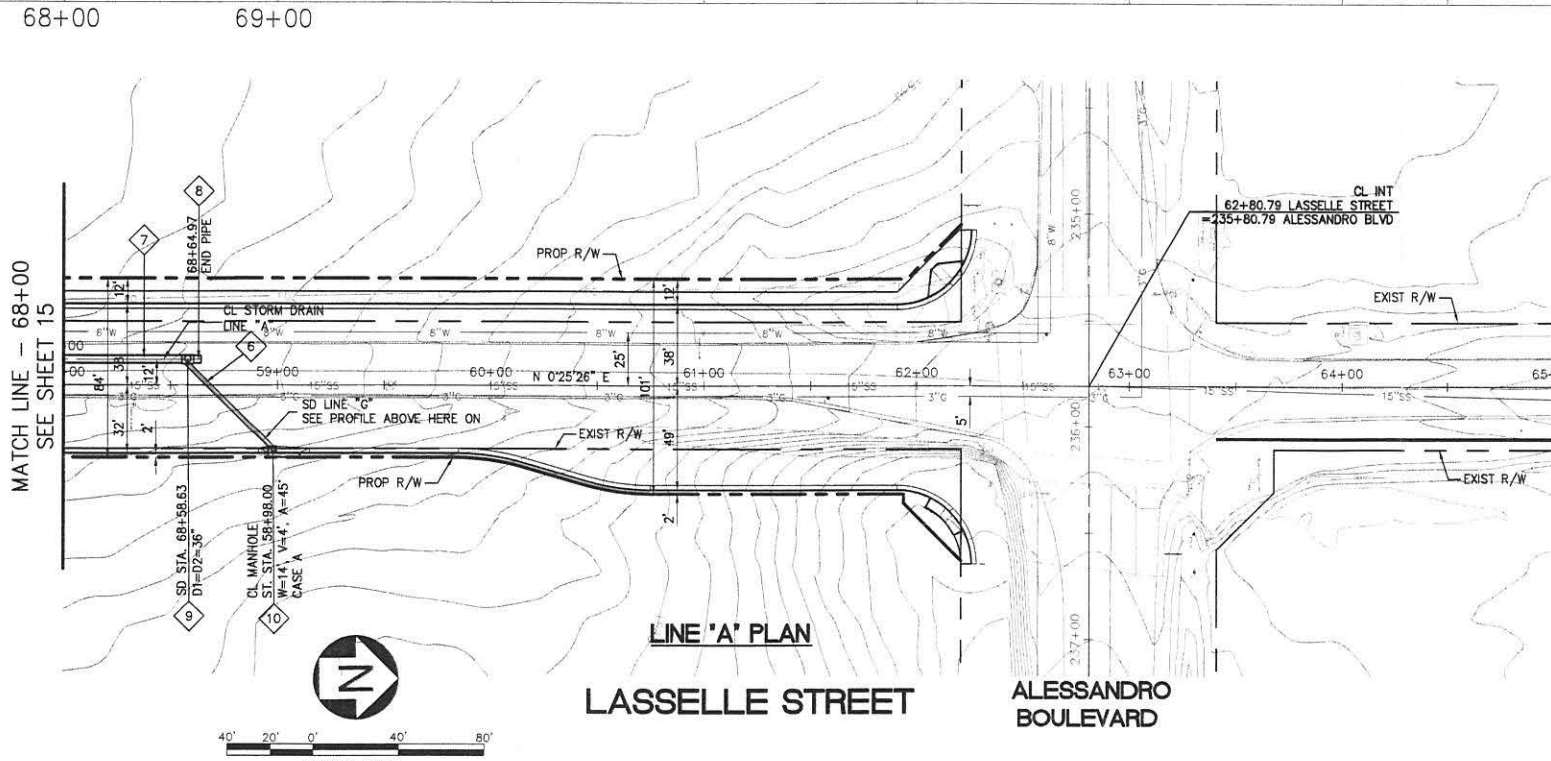
ACCT. NO. 501.82725  
 SHEET **15** NO. **43**  
 PROJECT NO. 06-50182725



- CONSTRUCTION NOTES:**
- 2 CONSTRUCT JUNCTION STRUCTURE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. JS227.
  - 5 CONSTRUCT CONCRETE COLLAR PER R.C.F.C.&W.C.D. STD. DWG. NO. M803.
  - 6 CONSTRUCT 18" R.C.P. (D-2000)
  - 7 CONSTRUCT 36" R.C.P. (D-1500)
  - 8 CONSTRUCT CONCRETE BULKHEAD PER R.C.F.C.&W.C.D. STD. DWG. NO. M816.
  - 9 CONSTRUCT MANHOLE NO. 2 PER R.C.F.C.&W.C.D. STD. DWG. NO. MH252.
  - 10 CONSTRUCT CURB OPENING CATCH BASIN WITH MANHOLE IN STREET PER S.P.P.W.C. STD. PLAN NO. 307-2.

- HATCH / LINE LEGEND**
- E EXISTING ELECTRICAL
  - FO EXISTING FIBER OPTIC
  - G EXISTING GAS
  - SD EXISTING STORM DRAIN
  - SS EXISTING SANITARY SEWER
  - T EXISTING TELECOMMUNICATION
  - W EXISTING WATER

- DISPOSITION NOTES**
- P PROTECT IN PLACE (ITEM AS INDICATED)
  - RL RELOCATE (ITEM AS INDICATED)
  - RC RELOCATE BY OTHERS (ITEM AS INDICATED)



- TRENCH NOTES:**
1. TRENCH BACKFILL PER CITY OF MORENO VALLEY STANDARD PLAN NO. 602B.
  2. ROADWAY REPAIR OVER TRENCH PER CITY OF MORENO VALLEY STANDARD PLAN NO. 602B.
  3. THE CITY SHALL APPROVE PIPE BEDDING PRIOR TO CONSTRUCTION.
  4. ALL MATERIAL TO BE PLACED IN 8" LIFTS, MAXIMUM.

**NOTE TO CONTRACTOR:**  
 LOCATION, TYPE, AND DEPTH OF EXISTING UTILITIES INCLUDING UTILITIES IDENTIFIED WITH POTHOLE DATA ARE APPROXIMATE. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO THE START OF EXCAVATION. CONTRACTOR SHALL TAKE CARE DURING EXCAVATION AND PROTECT IN PLACE ALL UTILITIES ENCOUNTERED. DAMAGED UTILITY FACILITIES SHALL BE REPAIRED AT NO ADDITIONAL COST.

NO WORK SHALL BE DONE ON THIS SITE UNTIL BELOW AGENCY IS NOTIFIED OF INTENTION TO GRADE OR EXCAVATE.  
 Underground Service Alert  
 Call: TOLL FREE  
 1-800-227-2600  
 TWO WORKING DAYS BEFORE YOU DIG

**BENCH MARK**  
 BM NO. M-40-4  
 NAVD88 ELEV: 1590.938 FEET  
 ADJ. YEAR: RCPD FIELD NOTES DATED 4/25/2001  
 FOUND 3" BRASS DISK STAMPED "M-40-4 RESET 1976" IN CONC. AT SE CORNER OF ALESSANDRO BLVD AND NASON STREET IN MORENO VALLEY, CA. POINT IS LOCATED APPROXIMATELY 56 FEET EAST OF CL OF NASON STREET AND APPROXIMATELY 48 FEET SOUTH OF CL OF ALESSANDRO BLVD.

**BASIS OF BEARING**  
 THE BASIS OF BEARING FOR THIS SURVEY IS THE NORTH AMERICAN DATUM OF 1983 (NAD83, CORS96), CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83), ZONE 6, BASED LOCALLY BETWEEN CORS STATIONS "BILL" (NGS PID AF8886) AND "CLAY" (NGS PID AA4817) BEING N44°41'21"W.

**CITY OF MORENO VALLEY APPROVALS**

APPROVED BY	DATE	BY
SUPERVISING SENIOR ENGINEER	8/28/08	(S)
CITY TRAFFIC ENGINEER	8/28/08	EL
MAINTENANCE AND OPERATIONS MANAGER	8/28/08	Ym
SENIOR ENGINEER	8/28/08	Ym

**PLANS PREPARED BY:**  
**PSOMAS**  
 3187 Red Hill Avenue, Suite 250  
 Costa Mesa, CA 92626  
 (714) 751-7273 Fax (714) 545-8883  
 UNDER THE SUPERVISION OF:  
 Nancy Boyer, P.E. 66531, Exp. 09/30/09  
 CIVIL ENGINEER  
 STATE OF CALIFORNIA

**CITY OF MORENO VALLEY**  
 LASSELIE STREET  
 STORM DRAIN IMPROVEMENT PLANS  
 STA. 68+00 TO END

ACCT. NO. 501.82725  
 SHEET **16** OF **43**  
 PROJECT NO. 06-50182725



# Appendix G

## POCKET MAP EXHIBITS

**M D S**  
CONSULTING

MORSE

SCHULTZ

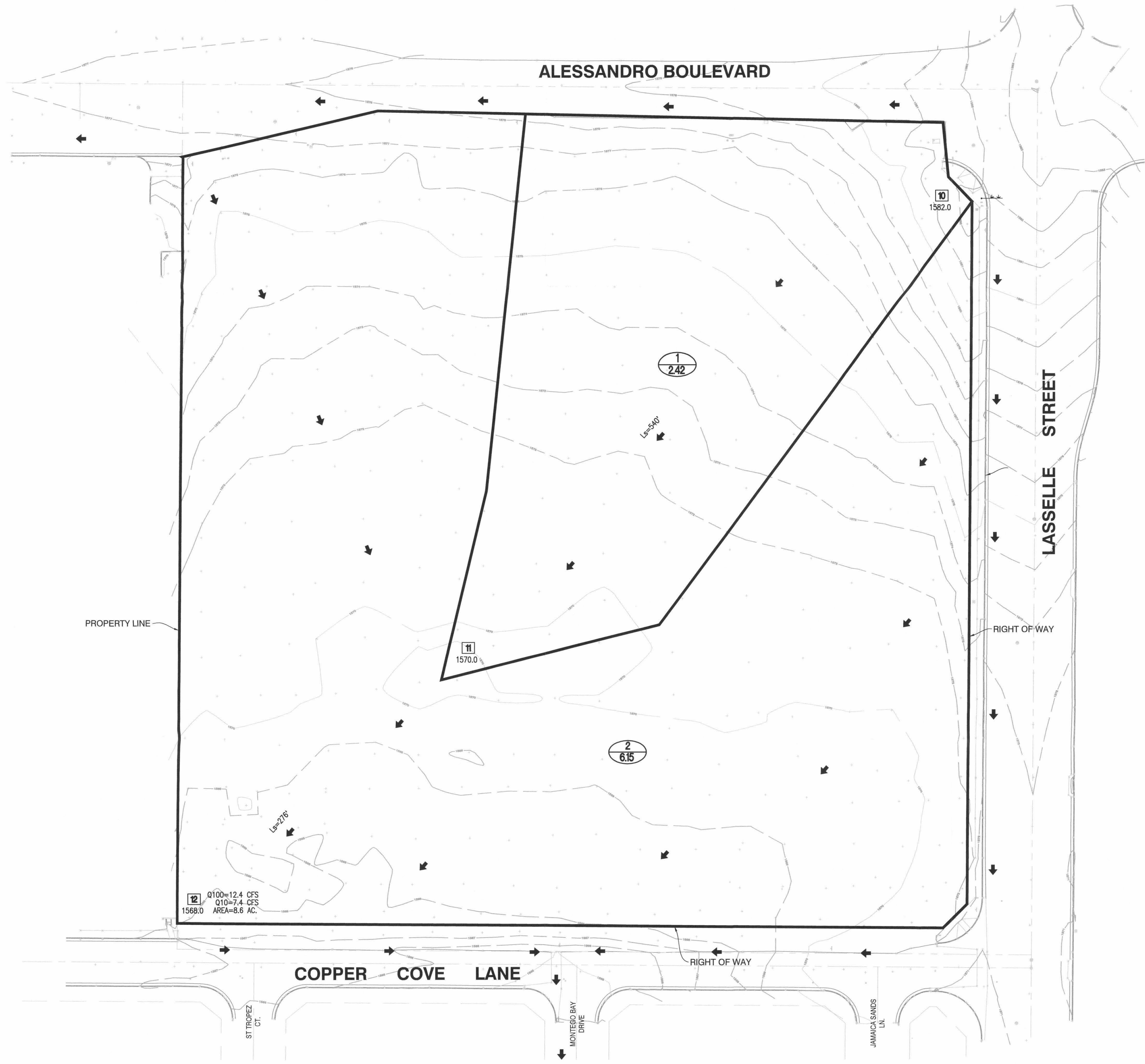
17320 Redhill Ave.  
Suite 350

Irvine, CA 92614

Voice: 949-251-8821

FAX: 949-251-0516






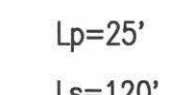


PLANNERS ENGINEERS SURVEYORS

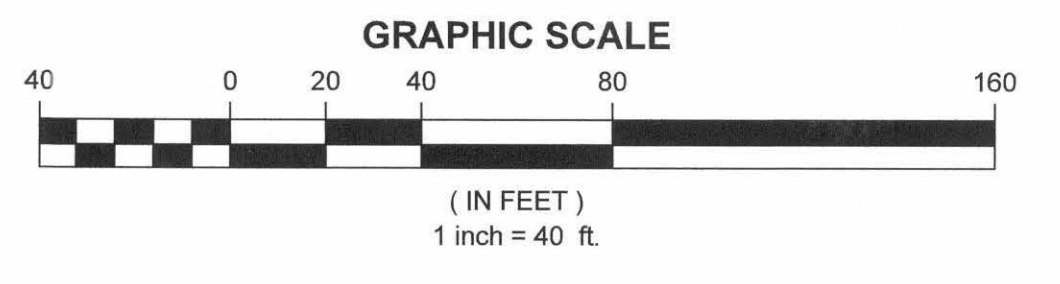
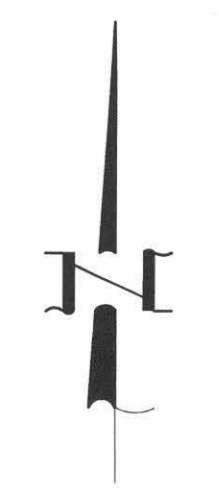


VICINITY MAP  
N.T.S.

**NOTE:**  
SOIL TYPE "B"

**LEGEND**

-  DRAINAGE AREA No.
-  DRAINAGE AREA (ACRE)
-  NODE NUMBER  
FINISH SURFACE ELEVATION  
INVERT ELEVATION
-  NODE NUMBER  
FINISH SURFACE ELEVATION
-  DIRECTION OF FLOW
-  DRAINAGE AREA BOUNDARY
-  LENGTH OF PIPE (FEET)
-  SURFACE FLOW LENGTH (FEET)



PEN22-0022 (LST22-0008)

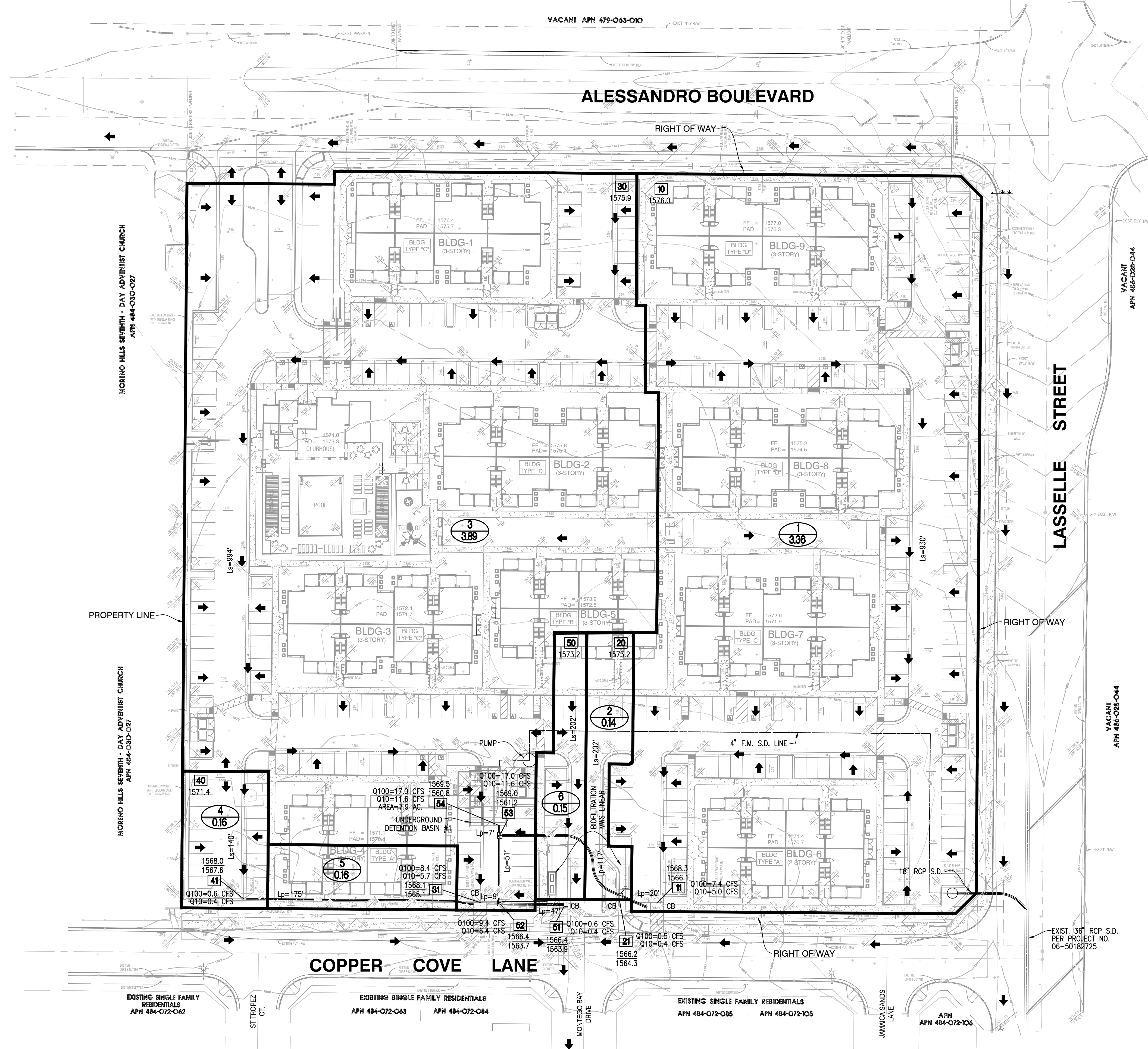
**MDS CONSULTING**  
PLANNERS ENGINEERS SURVEYORS

**PLATE 1**



**CRYSTAL COVE  
PRELIMINARY HYDROLOGY MAP  
UNDEVELOPED CONDITION**

Date	By	REVISIONS	App'd

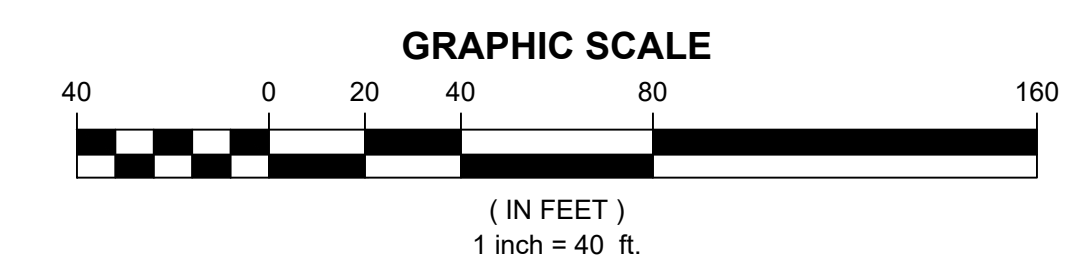
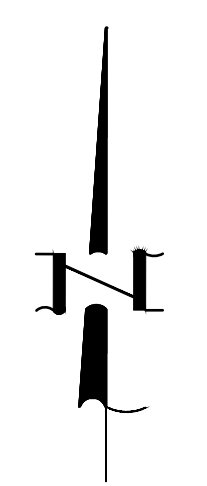


**VICINITY MAP**  
N.T.S.

**NOTE:**  
SOIL TYPE "B"

**LEGEND**

- DRAINAGE AREA No.
- DRAINAGE AREA (ACRE)
- NODE NUMBER  
FINISH SURFACE ELEVATION  
INVERT ELEVATION
- NODE NUMBER  
FINISH SURFACE ELEVATION
- DIRECTION OF FLOW
- DRAINAGE AREA BOUNDARY
- LENGTH OF PIPE (FEET)
- SURFACE FLOW LENGTH (FEET)



PEN22-0022 (LST22-0008)

<p><b>MDS CONSULTING</b> PLANNERS ENGINEERS SURVEYORS</p>	<p><b>PLATE 2</b></p>
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**CRYSTAL COVE  
PRELIMINARY HYDROLOGY MAP  
DEVELOPED CONDITION**

Date	By	REVISIONS	App'd