

Appendix F-2

Preliminary Drainage Report

PRELIMINARY DRAINAGE REPORT

For

6TH and Victoria Industrial

APN: 1192-281-09, 10, 11, 12, 13, & 14

PROJECT LOCATION

Northwest Corner of 6th Street & Victoria Avenue
City of Highland

PREPARED FOR

Patriot Development Partners
12126 W.Sunset Blvd.
Los Angeles, CA 90049
858-952-4134

PREPARED BY

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PREPARATION DATE

June 2, 2021

HZ PROJECT NUMBER

R312998.01

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Introduction

The project is a new development of an industrial facility located at the northwest corner of 6th Street and Victoria Avenue in the City of Highland, California. The majority of the site is currently vacant and some portions are occupied by residential buildings and storage yards. The proposed building is approximately 307,445 square feet in size on approximately 12.3 net acres.

Purpose

The purpose of this preliminary report is to present the drainage concept for the project and to determine the design flow rates and estimate storm drain sizes that will be needed for the proposed development. The drainage maps (Appendix A) and calculations reflect the tributary areas and 100-year storm event runoff flows (Q100).

Existing Condition

The project site is mostly vacant with scattered weeds and native grass and occupied by existing residences in the northwest corner, east-central, and south-central areas of the site. The site slopes from east to west having about eight (8) feet of fall. Existing runoff sheet flows westerly to Grape Street, continues south to 6th Street, and ultimately discharges to the City Creek Channel, Santa Ana River, and finally to the Prado Basin. Victoria Avenue runoff is collected by an existing drainage ditch inside of the property line and conveyed to an existing 48" CMP at the southeast corner of the project site. The offsite runoff then continues southerly and also discharges to the City Creek Channel. See Appendix A for existing site drainage map and Appendix E for existing drainage facilities.

Proposed Condition

The existing drainage patterns will be preserved in the proposed condition. For the proposed condition, all onsite runoff will be directed to the on-site underground infiltration/ detention system on the west side of the project site under the driveway and automobile parking area. The system will be designed to mitigate the peak flow increase from the proposed project. The overflow from the basin will be directed through a 4' wide parkway drain and discharge onto the 6th Street. The existing drainage ditch along Victoria Avenue will be removed and replaced by a proposed 42" storm drain and connected to the existing 48" CMP at the southeast corner of the project. See Appendix A for the proposed onsite hydrology map.

Hydrologic Analysis

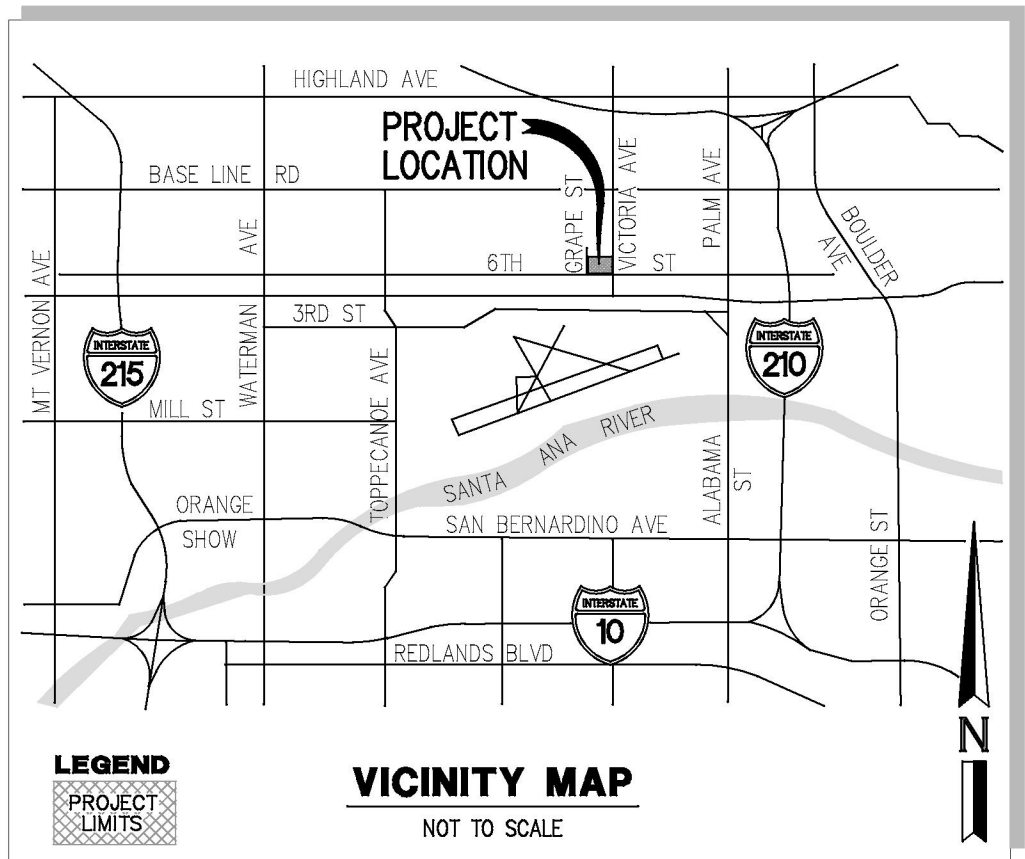
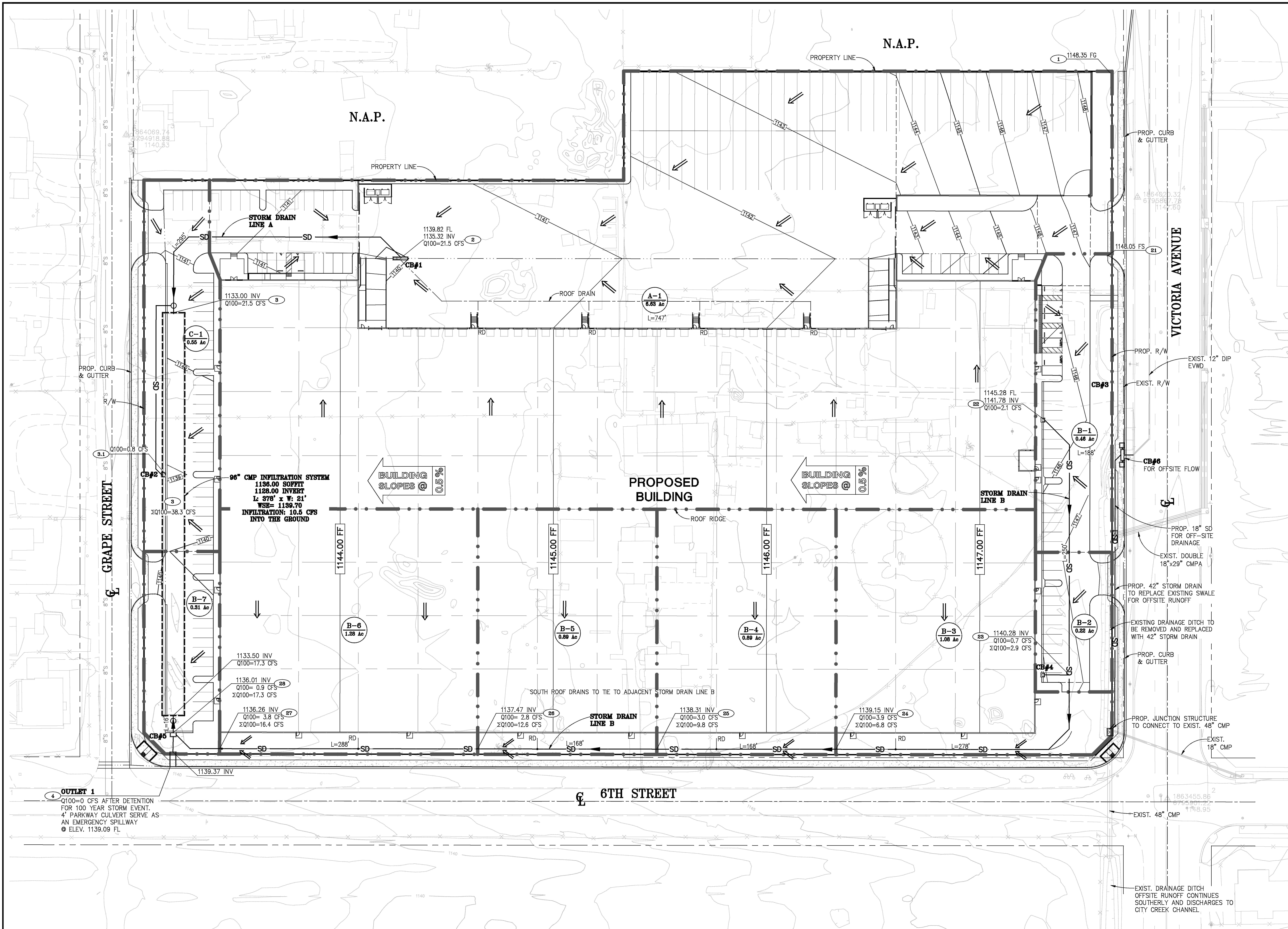
A hydrologic analysis was prepared using the methodology outlined in the San Bernardino County Flood Control District (SBCFCD) Hydrology Manual. A rational method analysis was completed for the existing and proposed 100-year return event using Civild software, version 7.1. Unit Hydrograph and Basin Routing analyses were also completed using Civild software.

The 100-year, 1-hour rainfall rate was taken from the isohyetal maps in the County of San Bernardino Hydrology Manual. The hydrologic soils type for the site is "B" and was taken from the soil map in the Hydrology Manual. A "commercial" land use was used with an AMC of 3. See Appendix D for Soil Group and Isohyetal Maps.

Discussion

According to the hydrologic analysis and basin routing studies for existing and proposed conditions, the results indicate the proposed Q100 will be mitigated and detained fully on-site in the underground system due to the high infiltration rate (57.2"/hour after factor of safety 3 applied). The proposed 4' parkway culvert in 6th Street will serve as an emergency spillway for the project site. The basin routing summary and analysis are included in Appendix C. All proposed drainage and storm drain facilities will be sized adequately for Q100 and additional calculations will be provided in final drainage report including storm drain hydraulics and catch basins sizing.

Appendix A
Preliminary Drainage Maps
100 Year Storm Event – Existing Condition
100 Year Storm Event – Proposed Condition



LEGEND

- NO. HYDROLOGY MODEL NODE NUMBER
- A-1 7.40 Ac. TRIBUTARY AREA IN ACRES
- 675' LENGTH OF FLOW
- DRAINAGE BOUNDARY
- DRAINAGE INLET/CATCH BASIN (CB)
- SD PROPOSED STORM DRAIN
- CB CATCH BASIN
- RD ROOF DRAIN
- ← FLOW DIRECTION

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PRELIMINARY HYDROLOGY MAP - PROPOSED
FOR
6TH AND VICTORIA INDUSTRIAL
CITY OF HIGHLAND

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DESIGNED BY R.P.	SHEET 1 OF 1 SHEETS
DRAWN BY R.P.	
CHECKED BY D.W.	
FILED BOOK 3122998.01	

Appendix B
100-year Rational Method Hydrologic Analysis
Existing Condition
Proposed Condition

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 03/31/21

6TH AND VICTORIA INDUSTRIAL, CITY OF HIGHLAND

100 YEAR STORM EVENT - EXISTING CONDITION

2998E100

RP

Program License Serial Number 6145

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.280 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 78.00
Adjusted SCS curve number for AMC 3 = 92.80
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140 (In/Hr)
Initial subarea data:
Initial area flow distance = 456.000 (Ft.)
Top (of initial area) elevation = 1147.800 (Ft.)
Bottom (of initial area) elevation = 1143.400 (Ft.)
Difference in elevation = 4.400 (Ft.)
Slope = 0.00965 s(%) = 0.96
 $TC = k(0.525) * [(length^3) / (elevation\ change)]^{0.2}$
Initial area time of concentration = 15.376 min.
Rainfall intensity = 2.897 (In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.857
Subarea runoff = 16.775 (CFS)
Total initial stream area = 6.760 (Ac.)
Pervious area fraction = 1.000
Initial area Fm value = 0.140 (In/Hr)

Process from Point/Station 2.000 to Point/Station 3.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1143.400 (Ft.)
Downstream point elevation = 1140.800 (Ft.)
Channel length thru subarea = 460.000 (Ft.)
Channel base width = 100.000 (Ft.)

Slope or 'Z' of left channel bank = 0.000
 Slope or 'Z' of right channel bank = 0.000
 Estimated mean flow rate at midpoint of channel = 20.921 (CFS)
 Manning's 'N' = 0.024
 Maximum depth of channel = 0.500 (Ft.)
 Flow(q) thru subarea = 20.921 (CFS)
 Depth of flow = 0.156 (Ft.), Average velocity = 1.344 (Ft/s)
 Channel flow top width = 100.000 (Ft.)
 Flow Velocity = 1.34 (Ft/s)
 Travel time = 5.70 min.
 Time of concentration = 21.08 min.
 Critical depth = 0.111 (Ft.)
 Adding area flow to channel
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 1.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 0.000
 SCS curve number for soil(AMC 2) = 78.00
 Adjusted SCS curve number for AMC 3 = 92.80
 Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140 (In/Hr)
 Rainfall intensity = 2.398 (In/Hr) for a 100.0 year storm
 Effective runoff coefficient used for area, (total area with modified
 rational method) (Q=KCIA) is C = 0.847
 Subarea runoff = 8.237 (CFS) for 5.550 (Ac.)
 Total runoff = 25.012 (CFS)
 Effective area this stream = 12.31 (Ac.)
 Total Study Area (Main Stream No. 1) = 12.31 (Ac.)
 Area averaged Fm value = 0.140 (In/Hr)
 Depth of flow = 0.173 (Ft.), Average velocity = 1.443 (Ft/s)
 Critical depth = 0.125 (Ft.)

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 03/31/21

6TH AND VICTORIA INDUSTRIAL, CITY OF HIGHLAND

100 YEAR STORM EVENT - PROPOSED CONDITION

2998P100

RP

Program License Serial Number 6145

***** Hydrology Study Control Information *****

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.280 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

+++++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044 (In/Hr)
Initial subarea data:
Initial area flow distance = 747.000(Ft.)
Top (of initial area) elevation = 1148.350(Ft.)
Bottom (of initial area) elevation = 1139.820(Ft.)
Difference in elevation = 8.530(Ft.)
Slope = 0.01142 s(%)= 1.14
 $TC = k(0.304)*[(length^3)/(elevation\ change)]^{0.2}$
Initial area time of concentration = 10.488 min.
Rainfall intensity = 3.645(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.889
Subarea runoff = 21.487(CFS)
Total initial stream area = 6.630(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1135.320(Ft.)
Downstream point/station elevation = 1133.000(Ft.)
Pipe length = 295.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 21.487(CFS)

Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 21.487(CFS)
Normal flow depth in pipe = 19.41(In.)
Flow top width inside pipe = 24.28(In.)
Critical Depth = 19.47(In.)
Pipe flow velocity = 7.03(Ft/s)
Travel time through pipe = 1.01 min.
Time of concentration (TC) = 11.49 min.

+++++
Process from Point/Station 3.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 1
Stream flow area = 6.630(Ac.)
Runoff from this stream = 21.487(CFS)
Time of concentration = 11.49 min.
Rainfall intensity = 3.450(In/Hr)
Area averaged loss rate (Fm) = 0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000

+++++
Process from Point/Station 21.000 to Point/Station 22.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Initial subarea data:
Initial area flow distance = 188.000(Ft.)
Top (of initial area) elevation = 1148.050(Ft.)
Bottom (of initial area) elevation = 1145.280(Ft.)
Difference in elevation = 2.770(Ft.)
Slope = 0.01473 s(%)= 1.47
TC = $k(0.304)*[(\text{length}^3)/(\text{elevation change})]^{0.2}$
Initial area time of concentration = 5.739 min.
Rainfall intensity = 5.233(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.892
Subarea runoff = 2.148(CFS)
Total initial stream area = 0.460(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 22.000 to Point/Station 23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1141.780(Ft.)
Downstream point/station elevation = 1140.280(Ft.)
Pipe length = 250.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 2.148(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 2.148(CFS)
Normal flow depth in pipe = 7.53(In.)
Flow top width inside pipe = 11.60(In.)

Critical Depth = 7.51(In.)
Pipe flow velocity = 4.14(Ft/s)
Travel time through pipe = 1.01 min.
Time of concentration (TC) = 6.75 min.

+++++
Process from Point/Station 23.000 to Point/Station 23.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 6.75 min.
Rainfall intensity = 4.750(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method) (Q=KCIA) is C = 0.892
Subarea runoff = 0.732(CFS) for 0.220(Ac.)
Total runoff = 2.880(CFS)
Effective area this stream = 0.68(Ac.)
Total Study Area (Main Stream No. 1) = 7.31(Ac.)
Area averaged Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 23.000 to Point/Station 24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1140.280(Ft.)
Downstream point/station elevation = 1139.150(Ft.)
Pipe length = 278.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 2.880(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 2.880(CFS)
Normal flow depth in pipe = 8.77(In.)
Flow top width inside pipe = 14.78(In.)
Critical Depth = 8.18(In.)
Pipe flow velocity = 3.86(Ft/s)
Travel time through pipe = 1.20 min.
Time of concentration (TC) = 7.94 min.

+++++
Process from Point/Station 24.000 to Point/Station 24.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 7.94 min.
Rainfall intensity = 4.306(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method) (Q=KCIA) is C = 0.891

Subarea runoff = 3.871(CFS) for 1.080(Ac.)
Total runoff = 6.751(CFS)
Effective area this stream = 1.76(Ac.)
Total Study Area (Main Stream No. 1) = 8.39(Ac.)
Area averaged Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 24.000 to Point/Station 25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1139.150(Ft.)
Downstream point/station elevation = 1138.310(Ft.)
Pipe length = 168.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 6.751(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 6.751(CFS)
Normal flow depth in pipe = 12.62(In.)
Flow top width inside pipe = 16.48(In.)
Critical Depth = 12.07(In.)
Pipe flow velocity = 5.10(Ft/s)
Travel time through pipe = 0.55 min.
Time of concentration (TC) = 8.49 min.

+++++
Process from Point/Station 25.000 to Point/Station 25.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 8.49 min.
Rainfall intensity = 4.137(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method) (Q=KCIA) is C = 0.890
Subarea runoff = 3.010(CFS) for 0.890(Ac.)
Total runoff = 9.761(CFS)
Effective area this stream = 2.65(Ac.)
Total Study Area (Main Stream No. 1) = 9.28(Ac.)
Area averaged Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 25.000 to Point/Station 26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1138.310(Ft.)
Downstream point/station elevation = 1137.470(Ft.)
Pipe length = 168.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 9.761(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 9.761(CFS)
Normal flow depth in pipe = 14.26(In.)
Flow top width inside pipe = 19.61(In.)
Critical Depth = 13.96(In.)
Pipe flow velocity = 5.61(Ft/s)
Travel time through pipe = 0.50 min.

Time of concentration (TC) = 8.99 min.

+++++
Process from Point/Station 26.000 to Point/Station 26.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 8.99 min.
Rainfall intensity = 3.997(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method) (Q=KCIA) is C = 0.890
Subarea runoff = 2.834(CFS) for 0.890(Ac.)
Total runoff = 12.595(CFS)
Effective area this stream = 3.54(Ac.)
Total Study Area (Main Stream No. 1) = 10.17(Ac.)
Area averaged Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 26.000 to Point/Station 27.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1137.470(Ft.)
Downstream point/station elevation = 1136.260(Ft.)
Pipe length = 242.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 12.595(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 12.595(CFS)
Normal flow depth in pipe = 15.18(In.)
Flow top width inside pipe = 23.14(In.)
Critical Depth = 15.32(In.)
Pipe flow velocity = 6.02(Ft/s)
Travel time through pipe = 0.67 min.
Time of concentration (TC) = 9.66 min.

+++++
Process from Point/Station 27.000 to Point/Station 27.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 9.66 min.
Rainfall intensity = 3.829(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified
rational method) (Q=KCIA) is C = 0.890
Subarea runoff = 3.822(CFS) for 1.280(Ac.)
Total runoff = 16.417(CFS)
Effective area this stream = 4.82(Ac.)

Total Study Area (Main Stream No. 1) = 11.45(Ac.)
Area averaged Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 27.000 to Point/Station 28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1136.210(Ft.)
Downstream point/station elevation = 1136.010(Ft.)
Pipe length = 46.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 16.417(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 16.417(CFS)
Normal flow depth in pipe = 17.32(In.)
Flow top width inside pipe = 25.90(In.)
Critical Depth = 16.98(In.)
Pipe flow velocity = 6.09(Ft/s)
Travel time through pipe = 0.13 min.
Time of concentration (TC) = 9.79 min.

+++++
Process from Point/Station 28.000 to Point/Station 28.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 9.79 min.
Rainfall intensity = 3.799(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method) (Q=KCIA) is C = 0.890
Subarea runoff = 0.919(CFS) for 0.310(Ac.)
Total runoff = 17.336(CFS)
Effective area this stream = 5.13(Ac.)
Total Study Area (Main Stream No. 1) = 11.76(Ac.)
Area averaged Fm value = 0.044(In/Hr)

+++++
Process from Point/Station 28.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1136.010(Ft.)
Downstream point/station elevation = 1133.500(Ft.)
Pipe length = 16.00(Ft.) Manning's N = 0.012
No. of pipes = 1 Required pipe flow = 17.336(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 17.336(CFS)
Normal flow depth in pipe = 8.60(In.)
Flow top width inside pipe = 14.84(In.)
Critical depth could not be calculated.
Pipe flow velocity = 23.84(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 9.80 min.

+++++
Process from Point/Station 3.000 to Point/Station 3.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2

Stream flow area = 5.130(Ac.)
Runoff from this stream = 17.336(CFS)
Time of concentration = 9.80 min.
Rainfall intensity = 3.796(In/Hr)
Area averaged loss rate (Fm) = 0.0440(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
------------	-----------------	------------	----------	------------	----------------------------

1	21.49	6.630	11.49	0.044	3.450
2	17.34	5.130	9.80	0.044	3.796

Qmax(1) =
1.000 * 1.000 * 21.487) +
0.908 * 1.000 * 17.336) + = 37.224
Qmax(2) =
1.102 * 0.853 * 21.487) +
1.000 * 1.000 * 17.336) + = 37.520

Total of 2 streams to confluence:
Flow rates before confluence point:
21.487 17.336
Maximum flow rates at confluence using above data:
37.224 37.520
Area of streams before confluence:
6.630 5.130
Effective area values after confluence:
11.760 10.783
Results of confluence:
Total flow rate = 37.520(CFS)
Time of concentration = 9.800 min.
Effective stream area after confluence = 10.783(Ac.)
Study area average Pervious fraction(Ap) = 0.100
Study area average soil loss rate(Fm) = 0.044(In/Hr)
Study area total (this main stream) = 11.76(Ac.)

+++++
Process from Point/Station 3.100 to Point/Station 3.000
**** SUBAREA FLOW ADDITION ****

COMMERCIAL subarea type

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 56.00
Adjusted SCS curve number for AMC 3 = 75.80
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)
Time of concentration = 9.80 min.
Rainfall intensity = 3.796(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area, (total area with modified rational method) (Q=KCIA) is C = 0.890
Subarea runoff = 0.753(CFS) for 0.550(Ac.)
Total runoff = 38.273(CFS)
Effective area this stream = 11.33(Ac.)

Total Study Area (Main Stream No. 1) = 12.31 (Ac.)
Area averaged Fm value = 0.044 (In/Hr)
End of computations, Total Study Area = 12.31 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction (A_p) = 0.100
Area averaged SCS curve number = 56.0

Appendix C
100-year Existing & Proposed Unit Hydrograph Studies
Infiltration/ Detention System Basin Routing Studies

6th and Victoria Industrial

Stage Storage Table

Detention/ Infiltration System Routing Study Summary

#	Depth	Elevation	Area (sf)	Incremental volume (cf)	Total Volume (cf)	Total Volume (acre-ft)	Outflow Q	Notes
1	0.0	1,127.50	7,707	0	0	0		Bottom of 96" CMP Infiltration/ Detention System
2	0.5	1,128.00	7,707	1,588	1,588	0.036	10.48	Invert of 96" CMP
3	1.5	1,129.00	7,707	4,824	6,412	0.147	10.48	
4	2.5	1,130.00	7,707	5,995	12,407	0.285	10.48	
5	3.5	1,131.00	7,707	6,536	18,943	0.435	10.48	
6	4.5	1,132.00	7,707	6,776	25,719	0.590	10.48	
7	5.5	1,133.00	7,707	6,775	32,494	0.746	10.48	
8	6.5	1,134.00	7,707	6,536	39,030	0.896	10.48	
9	7.5	1,135.00	7,707	5,995	45,025	1.034	10.48	
10	8.5	1,136.00	7,707	4,825	49,850	1.144	10.48	Soffit of 96" CMP
11	9.0	1,136.50	7,707	1,588	51,438	1.181	10.48	Top of Infiltration/ Detention System *Meets WQMP DCV
12	10.0	1,137.50	7,707	0	51,438	1.181	10.48	
13	11.0	1,138.50	7,707	0	51,438	1.181	10.48	
14	12.0	1,139.50	7,707	0	51,438	1.181	12.64	Release Water @ 4' Parkway Drain's Upstream @ ELEV. 1139.37
15	12.5	1,140.00	7,707	0	51,438	1.181	14.79	
96" CMP system with 6" rock top & bottom.								

Infiltration rate per geotechnical report = 171.6"/hr, Factor of Safety =3.

Unit convert = (171.6"/hr)/3 x (1'/12") X (1hr/60min) X (1 min/60 sec) = 0.00132 ft/sec

Underground Basin open area is 378' x 21' = 7,938 sf

Therefore, Q out for basin = 7,938 X 0.00132 = 10.48 cfs

*WQMP Design Capture Volume is 51,354 CF

$$\begin{aligned}
 Q \text{ OutFlow} &= 4' \text{ Parkway Drain} + \text{Basin Infiltration } Q \\
 &= (CA \times (2gh)^{(1/2)}) + \text{Basin Infiltration } Q \\
 &= (0.6A \times (64.4xh)^{(1/2)}) + \text{Basin Infiltration } Q \\
 A &= 4' \times 4' \text{ Parkway Culvert Opening} \\
 h &= \text{Water Height Above half of opening (2")}
 \end{aligned}$$

Example: WSE @ 1140

$$\begin{aligned}
 &= \{0.6 \times (4 \times .33) \times [64.4 \times (1140 - 1139.54)]^{(1/2)}\} + 10.48 \\
 &= 14.79 \text{ cfs}
 \end{aligned}$$

Basin Routing Summary Table

100 YEAR STORM	
Max. Q Out (CFS)	10.48
WSE	1131.72

0 CFS to public street, 10.48 CFS into the ground
Underground System Top: 1136.50

Allowable discharge 25.0 CFS (from Existing Unit Hydrograph).

The on-site Q100 storm will be detained in the system and infiltrated into the ground without discharge to public due to the high infiltration rate.

Proposed 4' parkway culvert will be served as an emergency spillway for the project.



CMP: Underground Detention System Storage Volume Estimation

=Adjustable Input Cells

Date: 5/26/2021
Project Name: 96 CMP Detention - 31064 cf. - 4880 (5-26-2021 17-58-43)

City / County: Highland/ San Bernardino
State: CA

Designed By: Ryan Peng
Company: Huitt-Zollars, Inc
Telephone: 909-941-7799

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular application and are subject to verification of the Engineer of Record. This tool is only applicable for rectangular shaped systems.

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	376.0	Backfill Porosity (%):	40%	System Diameter (in):	96
Out-to-out width (ft):	19.0	Depth Above Pipe (in):	6.0	Pipe Spacing (in):	36
Number of Manifolds (ea):	2.0	Depth Below Pipe (in):	6.0	Incremental Analysis (in):	6
Number of Barrels (ea):	2.0	Width At Ends (ft):	1.0	System Invert (Elevation):	1127.5
		Width At Sides (ft):	1.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)
0.00	1127.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	3,175.2
0.50	1128.00	0.0	0.0	1,587.6	1,587.6	1,587.6	1,587.6	0.0%	3,175.2
1.00	1128.50	991.5	991.5	1,191.0	2,778.6	2,182.5	3,770.1	26.3%	4,936.6
1.50	1129.00	1,757.4	2,748.9	884.6	3,663.2	2,642.0	6,412.1	42.9%	5,581.8
2.00	1129.50	2,196.6	4,945.5	709.0	4,372.2	2,905.6	9,317.7	53.1%	6,015.4
2.50	1130.00	2,503.3	7,448.8	586.3	4,958.5	3,089.6	12,407.3	60.0%	6,326.1
3.00	1130.50	2,723.7	10,172.5	498.1	5,456.6	3,221.8	15,629.1	65.1%	6,548.1
3.50	1131.00	2,877.8	13,050.4	436.5	5,893.0	3,314.3	18,943.4	68.9%	6,698.1
4.00	1131.50	2,976.1	16,026.5	397.1	6,290.2	3,373.3	22,316.7	71.8%	6,785.1
4.50	1132.00	3,024.1	19,050.6	378.0	6,668.2	3,402.1	25,718.8	74.1%	6,813.6
5.00	1132.50	3,024.1	22,074.7	378.0	7,046.1	3,402.1	29,120.8	75.8%	6,785.1
5.50	1133.00	2,976.1	25,050.8	397.1	7,443.3	3,373.3	32,494.1	77.1%	6,698.1
6.00	1133.50	2,877.8	27,928.7	436.5	7,879.7	3,314.3	35,808.4	78.0%	6,548.1
6.50	1134.00	2,723.7	30,652.4	498.1	8,377.8	3,221.8	39,030.2	78.5%	6,326.1
7.00	1134.50	2,503.3	33,155.7	586.3	8,964.1	3,089.6	42,119.8	78.7%	6,015.4
7.50	1135.00	2,196.6	35,352.4	709.0	9,673.1	2,905.6	45,025.4	78.5%	5,581.8
8.00	1135.50	1,757.4	37,109.7	884.6	10,557.7	2,642.0	47,667.4	77.9%	4,936.6
8.50	1136.00	991.5	38,101.2	1,191.0	11,748.7	2,182.5	49,849.9	76.4%	3,175.2
9.00	1136.50	0.0	38,101.2	1,587.6	13,336.3	1,587.6	51,437.5	74.1%	3,175.2

These results are submitted to you as a guideline only, without liability on the part of CONTECH Engineered Solutions, LLC for accuracy or suitability to any particular application, and are subject to your verification.

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

Study date 04/01/21

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6145

6TH AND VICTORIA INDUSTRIAL, CITY OF HIGHLAND
100 YEAR STORM EVENT - EXISTING CONDITION
UNITHYDROGRAPH, 2998E100UN
RP

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
12.31	1	1.28

Rainfall data for year 100
12.31 6 2.70

Rainfall data for year 100
12.31 24 5.75

+++++

***** Area-averaged max loss rate, Fm *****

SCS curve No. (AMCII)	SCS curve NO. (AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
78.0	92.8	12.31	1.000	0.140	1.000	0.140

Area-averaged adjusted loss rate Fm (In/Hr) = 0.140

***** Area-Averaged low loss rate fraction, Yb *****

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
---------------	---------------	------------------	------------------	---	----------------------

12.31 1.000 78.0 92.8 0.78 0.855

Area-averaged catchment yield fraction, Y = 0.855
Area-averaged low loss fraction, Yb = 0.145
Direct entry of lag time by user
+++++
Watershed area = 12.31(Ac.)
Catchment Lag time = 0.308 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 27.0563
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.140(In/Hr)
Average low loss rate fraction (Yb) = 0.145 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.474(In)
Computed peak 30-minute rainfall = 0.970(In)
Specified peak 1-hour rainfall = 1.280(In)
Computed peak 3-hour rainfall = 2.023(In)
Specified peak 6-hour rainfall = 2.700(In)
Specified peak 24-hour rainfall = 5.750(In)

Rainfall depth area reduction factors:
Using a total area of 12.31(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.473(In)
30-minute factor = 0.999	Adjusted rainfall = 0.969(In)
1-hour factor = 0.999	Adjusted rainfall = 1.279(In)
3-hour factor = 1.000	Adjusted rainfall = 2.023(In)
6-hour factor = 1.000	Adjusted rainfall = 2.700(In)
24-hour factor = 1.000	Adjusted rainfall = 5.750(In)

Unit Hydrograph
+++++
Interval 'S' Graph Unit Hydrograph
Number Mean values ((CFS))

(K = 148.87 (CFS))

1	1.704	2.537
2	8.959	10.801
3	24.196	22.683
4	44.808	30.686
5	67.967	34.478
6	81.945	20.808
7	90.444	12.654
8	95.044	6.848
9	97.499	3.655
10	98.427	1.380
11	98.914	0.725
12	99.401	0.725
13	100.000	0.362

Total soil rain loss = 0.76(In)
Total effective rainfall = 4.99(In)
Peak flow rate in flood hydrograph = 25.01(CFS)

+++++
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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0002		0.02	Q				
0+10	0.0010		0.12	Q				
0+15	0.0033		0.34	Q				
0+20	0.0076		0.62	Q				
0+25	0.0141		0.94	VQ				
0+30	0.0220		1.14	VQ				
0+35	0.0307		1.26	VQ				
0+40	0.0398		1.33	VQ				
0+45	0.0492		1.36	VQ				
0+50	0.0587		1.38	VQ				
0+55	0.0683		1.39	VQ				
1+ 0	0.0779		1.40	VQ				
1+ 5	0.0876		1.41	VQ				
1+10	0.0974		1.41	VQ				
1+15	0.1071		1.42	VQ				
1+20	0.1169		1.42	VQ				
1+25	0.1267		1.42	VQ				
1+30	0.1365		1.43	IQ				
1+35	0.1463		1.43	IQ				
1+40	0.1562		1.43	IQ				
1+45	0.1661		1.44	IQ				
1+50	0.1760		1.44	IQ				
1+55	0.1860		1.44	IQ				
2+ 0	0.1959		1.45	IQ				
2+ 5	0.2059		1.45	IQ				
2+10	0.2160		1.46	IQ				
2+15	0.2260		1.46	IQ				
2+20	0.2361		1.46	IQ				
2+25	0.2462		1.47	IQ				
2+30	0.2564		1.47	IQV				
2+35	0.2665		1.48	IQV				
2+40	0.2767		1.48	IQV				
2+45	0.2869		1.48	IQV				
2+50	0.2972		1.49	IQV				
2+55	0.3075		1.49	IQV				
3+ 0	0.3178		1.50	IQV				
3+ 5	0.3281		1.50	I Q				
3+10	0.3385		1.50	I Q				
3+15	0.3489		1.51	I Q				
3+20	0.3593		1.51	I Q				
3+25	0.3697		1.52	I Q				
3+30	0.3802		1.52	I Q				
3+35	0.3907		1.53	I QV				
3+40	0.4013		1.53	I QV				
3+45	0.4119		1.54	I QV				
3+50	0.4225		1.54	I QV				
3+55	0.4331		1.55	I QV				
4+ 0	0.4438		1.55	I QV				
4+ 5	0.4545		1.55	I QV				
4+10	0.4652		1.56	I QV				
4+15	0.4760		1.56	I QV				
4+20	0.4868		1.57	I QV				
4+25	0.4977		1.57	I QV				
4+30	0.5086		1.58	I QV				
4+35	0.5195		1.58	I Q V				
4+40	0.5304		1.59	I Q V				
4+45	0.5414		1.59	I Q V				

4+50	0.5524	1.60	Q V				
4+55	0.5635	1.61	Q V				
5+ 0	0.5746	1.61	Q V				
5+ 5	0.5857	1.62	Q V				
5+10	0.5969	1.62	Q V				
5+15	0.6081	1.63	Q V				
5+20	0.6193	1.63	Q V				
5+25	0.6306	1.64	Q V				
5+30	0.6419	1.64	Q V				
5+35	0.6533	1.65	Q V				
5+40	0.6647	1.66	Q V				
5+45	0.6761	1.66	Q V				
5+50	0.6876	1.67	Q V				
5+55	0.6991	1.67	Q V				
6+ 0	0.7107	1.68	Q V				
6+ 5	0.7223	1.69	Q V				
6+10	0.7340	1.69	Q V				
6+15	0.7456	1.70	Q V				
6+20	0.7574	1.70	Q V				
6+25	0.7692	1.71	Q V				
6+30	0.7810	1.72	Q V				
6+35	0.7929	1.72	Q V				
6+40	0.8048	1.73	Q V				
6+45	0.8168	1.74	Q V				
6+50	0.8288	1.74	Q V				
6+55	0.8408	1.75	Q V				
7+ 0	0.8529	1.76	Q V				
7+ 5	0.8651	1.77	Q V				
7+10	0.8773	1.77	Q V				
7+15	0.8896	1.78	Q V				
7+20	0.9019	1.79	Q V				
7+25	0.9142	1.80	Q V				
7+30	0.9267	1.80	Q V				
7+35	0.9391	1.81	Q V				
7+40	0.9517	1.82	Q V				
7+45	0.9642	1.83	Q V				
7+50	0.9769	1.83	Q V				
7+55	0.9896	1.84	Q V				
8+ 0	1.0023	1.85	Q V				
8+ 5	1.0151	1.86	Q V				
8+10	1.0280	1.87	Q V				
8+15	1.0409	1.88	Q V				
8+20	1.0539	1.89	Q V				
8+25	1.0669	1.89	Q V				
8+30	1.0800	1.90	Q V				
8+35	1.0932	1.91	Q V				
8+40	1.1064	1.92	Q V				
8+45	1.1197	1.93	Q V				
8+50	1.1331	1.94	Q V				
8+55	1.1465	1.95	Q V				
9+ 0	1.1601	1.96	Q V				
9+ 5	1.1736	1.97	Q V				
9+10	1.1873	1.98	Q V				
9+15	1.2010	1.99	Q V				
9+20	1.2148	2.00	Q V				
9+25	1.2286	2.01	Q V				
9+30	1.2426	2.02	Q V				
9+35	1.2566	2.04	Q V				
9+40	1.2707	2.05	Q V				
9+45	1.2849	2.06	Q V				
9+50	1.2991	2.07	Q V				
9+55	1.3135	2.08	Q V				
10+ 0	1.3279	2.09	Q V				

10+ 5	1.3424	2.11	Q	V			
10+10	1.3570	2.12	Q	V			
10+15	1.3717	2.13	Q	V			
10+20	1.3865	2.15	Q	V			
10+25	1.4014	2.16	Q	V			
10+30	1.4164	2.17	Q	V			
10+35	1.4314	2.19	Q	V			
10+40	1.4466	2.20	Q	V			
10+45	1.4619	2.22	Q	V			
10+50	1.4772	2.23	Q	V			
10+55	1.4927	2.25	Q	V			
11+ 0	1.5083	2.26	Q	V			
11+ 5	1.5240	2.28	Q	V			
11+10	1.5398	2.30	Q	V			
11+15	1.5558	2.31	Q	V			
11+20	1.5718	2.33	Q	V			
11+25	1.5880	2.35	Q	V			
11+30	1.6043	2.37	Q	V			
11+35	1.6207	2.38	Q	V			
11+40	1.6372	2.40	Q	V			
11+45	1.6539	2.42	Q	V			
11+50	1.6708	2.44	Q	V			
11+55	1.6877	2.46	Q	V			
12+ 0	1.7049	2.49	Q	V			
12+ 5	1.7220	2.50	Q	V			
12+10	1.7391	2.47	Q	V			
12+15	1.7556	2.40	Q	V			
12+20	1.7715	2.30	Q	V			
12+25	1.7865	2.18	Q	V			
12+30	1.8011	2.12	Q	V			
12+35	1.8156	2.10	Q	V			
12+40	1.8300	2.09	Q	V			
12+45	1.8445	2.11	Q	V			
12+50	1.8592	2.13	Q	V			
12+55	1.8740	2.16	Q	V			
13+ 0	1.8891	2.18	Q	V			
13+ 5	1.9043	2.21	Q	V			
13+10	1.9198	2.25	Q	V			
13+15	1.9355	2.28	Q	V			
13+20	1.9515	2.32	Q	V			
13+25	1.9677	2.36	Q	V			
13+30	1.9842	2.40	Q	V			
13+35	2.0010	2.44	Q	V			
13+40	2.0181	2.48	Q	V			
13+45	2.0355	2.53	Q	V			
13+50	2.0532	2.57	Q	V			
13+55	2.0713	2.63	Q	V			
14+ 0	2.0897	2.68	Q	V			
14+ 5	2.1086	2.74	Q	V			
14+10	2.1278	2.79	Q	V			
14+15	2.1475	2.86	Q	V			
14+20	2.1677	2.93	Q	V			
14+25	2.1883	3.00	Q	V			
14+30	2.2095	3.08	Q	V			
14+35	2.2313	3.16	Q	V			
14+40	2.2537	3.25	Q	V			
14+45	2.2767	3.35	Q	V			
14+50	2.3005	3.45	Q	V			
14+55	2.3250	3.57	Q	V			
15+ 0	2.3504	3.69	Q	V			
15+ 5	2.3768	3.83	Q	V			
15+10	2.4042	3.98	Q	V			
15+15	2.4329	4.16	Q	V			

15+20	2.4628	4.35		Q		V			
15+25	2.4942	4.57		Q		V			
15+30	2.5273	4.80		Q		V			
15+35	2.5623	5.07		Q		V			
15+40	2.5993	5.38		Q		V			
15+45	2.6391	5.77		Q		V			
15+50	2.6824	6.30		Q		V			
15+55	2.7311	7.07		Q		V			
16+ 0	2.7882	8.28			Q	V			
16+ 5	2.8641	11.03			Q	V			
16+10	2.9745	16.03				Q V			
16+15	3.1249	21.85				V	Q		
16+20	3.2972	25.01				V		Q	
16+25	3.4694	25.01				V		Q	
16+30	3.5947	18.19				Q	V		
16+35	3.6866	13.34			Q		V		
16+40	3.7535	9.71			Q		V		
16+45	3.8045	7.40			Q		V		
16+50	3.8441	5.76		Q			V		
16+55	3.8781	4.93		Q			V		
17+ 0	3.9089	4.47		Q			V		
17+ 5	3.9363	3.98		Q			V		
17+10	3.9608	3.55		Q			V		
17+15	3.9837	3.32		Q			V		
17+20	4.0052	3.13		Q			V		
17+25	4.0257	2.97		Q			V		
17+30	4.0452	2.83		Q			V		
17+35	4.0638	2.71		Q			V		
17+40	4.0817	2.60		Q			V		
17+45	4.0990	2.50		Q			V		
17+50	4.1156	2.41		Q			V		
17+55	4.1317	2.33		Q			V		
18+ 0	4.1472	2.26		Q			V		
18+ 5	4.1624	2.21		Q			V		
18+10	4.1775	2.19		Q			V		
18+15	4.1928	2.22		Q			V		
18+20	4.2086	2.30		Q			V		
18+25	4.2251	2.39		Q			V		
18+30	4.2418	2.43		Q			V		
18+35	4.2586	2.44		Q			V		
18+40	4.2752	2.42		Q			V		
18+45	4.2917	2.40		Q			V		
18+50	4.3080	2.36		Q			V		
18+55	4.3241	2.33		Q			V		
19+ 0	4.3399	2.30		Q			V		
19+ 5	4.3555	2.27		Q			V		
19+10	4.3709	2.24		Q			V		
19+15	4.3861	2.21		Q			V		
19+20	4.4011	2.18		Q			V		
19+25	4.4159	2.15		Q			V		
19+30	4.4306	2.12		Q			V		
19+35	4.4450	2.10		Q			V		
19+40	4.4593	2.07		Q			V		
19+45	4.4734	2.05		Q			V		
19+50	4.4874	2.03		Q			V		
19+55	4.5012	2.01		Q			V		
20+ 0	4.5148	1.98		Q			V		
20+ 5	4.5284	1.96		Q			V		
20+10	4.5417	1.94		Q			V		
20+15	4.5550	1.92		Q			V		
20+20	4.5681	1.91		Q			V		
20+25	4.5811	1.89		Q			V		
20+30	4.5940	1.87		Q			V		

20+35	4.6068	1.85	Q				V	
20+40	4.6194	1.84	Q				V	
20+45	4.6319	1.82	Q				V	
20+50	4.6444	1.80	Q				V	
20+55	4.6567	1.79	Q				V	
21+ 0	4.6689	1.77	Q				V	
21+ 5	4.6810	1.76	Q				V	
21+10	4.6931	1.75	Q				V	
21+15	4.7050	1.73	Q				V	
21+20	4.7168	1.72	Q				V	
21+25	4.7286	1.71	Q				V	
21+30	4.7402	1.69	Q				V	
21+35	4.7518	1.68	Q				V	
21+40	4.7633	1.67	Q				V	
21+45	4.7747	1.66	Q				V	
21+50	4.7860	1.65	Q				V	
21+55	4.7973	1.63	Q				V	
22+ 0	4.8085	1.62	Q				V	
22+ 5	4.8196	1.61	Q				V	
22+10	4.8306	1.60	Q				V	
22+15	4.8415	1.59	Q				V	
22+20	4.8524	1.58	Q				V	
22+25	4.8632	1.57	Q				V	
22+30	4.8740	1.56	Q				V	
22+35	4.8847	1.55	Q				V	
22+40	4.8953	1.54	Q				V	
22+45	4.9058	1.53	Q				V	
22+50	4.9163	1.52	Q				V	
22+55	4.9268	1.51	Q				V	
23+ 0	4.9371	1.51	Q				V	
23+ 5	4.9474	1.50	Q				V	
23+10	4.9577	1.49	Q				V	
23+15	4.9679	1.48	Q				V	
23+20	4.9780	1.47	Q				V	
23+25	4.9881	1.46	Q				V	
23+30	4.9982	1.46	Q				V	
23+35	5.0081	1.45	Q				V	
23+40	5.0181	1.44	Q				V	
23+45	5.0279	1.43	Q				V	
23+50	5.0378	1.43	Q				V	
23+55	5.0475	1.42	Q				V	
24+ 0	5.0573	1.41	Q				V	
24+ 5	5.0668	1.38	Q				V	
24+10	5.0756	1.27	Q				V	
24+15	5.0828	1.06	Q				V	
24+20	5.0881	0.77	Q				V	
24+25	5.0912	0.44	Q				V	
24+30	5.0929	0.25	Q				V	
24+35	5.0938	0.13	Q				V	
24+40	5.0942	0.06	Q				V	
24+45	5.0944	0.03	Q				V	
24+50	5.0945	0.02	Q				V	
24+55	5.0946	0.01	Q				V	
25+ 0	5.0946	0.00	Q				V	

Unit Hydrograph Analysis

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Study date 04/01/21

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6145

6TH AND VICTORIA INDUSTRIAL, CITY OF HIGHLAND
100 YEAR STORM EVENT - PROPOSED CONDITION
UNITHYDROGRAPH, 2988P100UH
RP

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
12.31	1	1.28

Rainfall data for year 100
12.31 6 2.70

Rainfall data for year 100
12.31 24 5.75

+++++

***** Area-averaged max loss rate, Fm *****

SCS curve No. (AMCII)	SCS curve NO. (AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
56.0	75.8	12.31	1.000	0.440	0.100	0.044

Area-averaged adjusted loss rate Fm (In/Hr) = 0.044

***** Area-Averaged low loss rate fraction, Yb *****

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
---------------	---------------	------------------	------------------	---	----------------------

1.23	0.100	56.0	75.8	3.19	0.547
11.08	0.900	98.0	98.0	0.20	0.959

Area-averaged catchment yield fraction, Y = 0.917
Area-averaged low loss fraction, Yb = 0.083
User entry of time of concentration = 0.166 (hours)
++++
Watershed area = 12.31(Ac.)
Catchment Lag time = 0.133 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 62.6378
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.044(In/Hr)
Average low loss rate fraction (Yb) = 0.083 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.474(In)
Computed peak 30-minute rainfall = 0.970(In)
Specified peak 1-hour rainfall = 1.280(In)
Computed peak 3-hour rainfall = 2.023(In)
Specified peak 6-hour rainfall = 2.700(In)
Specified peak 24-hour rainfall = 5.750(In)

Rainfall depth area reduction factors:
Using a total area of 12.31(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999	Adjusted rainfall = 0.473(In)
30-minute factor = 0.999	Adjusted rainfall = 0.969(In)
1-hour factor = 0.999	Adjusted rainfall = 1.279(In)
3-hour factor = 1.000	Adjusted rainfall = 2.023(In)
6-hour factor = 1.000	Adjusted rainfall = 2.700(In)
24-hour factor = 1.000	Adjusted rainfall = 5.750(In)

Unit Hydrograph
++++
Interval 'S' Graph Unit Hydrograph
Number Mean values ((CFS))

(K = 148.87 (CFS))

1	7.084	10.547
2	44.883	56.273
3	84.069	58.337
4	96.416	18.381
5	98.874	3.659
6	100.000	1.677

Total soil rain loss = 0.41(In)
Total effective rainfall = 5.34(In)
Peak flow rate in flood hydrograph = 38.29(CFS)

++++
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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume	Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
-----------	--------	-------	--------	---	------	------	------	------

0+ 5	0.0007	0.11	Q				
0+10	0.0053	0.67	Q				
0+15	0.0140	1.25	VQ				
0+20	0.0239	1.44	VQ				
0+25	0.0341	1.48	VQ				
0+30	0.0444	1.50	VQ				
0+35	0.0547	1.50	VQ				
0+40	0.0651	1.51	VQ				
0+45	0.0755	1.51	VQ				
0+50	0.0859	1.51	VQ				
0+55	0.0964	1.52	VQ				
1+ 0	0.1069	1.52	VQ				
1+ 5	0.1174	1.53	VQ				
1+10	0.1279	1.53	VQ				
1+15	0.1385	1.53	IQ				
1+20	0.1491	1.54	IQ				
1+25	0.1597	1.54	IQ				
1+30	0.1703	1.55	IQ				
1+35	0.1810	1.55	IQ				
1+40	0.1917	1.55	IQ				
1+45	0.2024	1.56	IQ				
1+50	0.2132	1.56	IQ				
1+55	0.2239	1.57	IQ				
2+ 0	0.2347	1.57	IQ				
2+ 5	0.2456	1.57	IQ				
2+10	0.2565	1.58	IQ				
2+15	0.2674	1.58	IQ				
2+20	0.2783	1.59	IQV				
2+25	0.2892	1.59	IQV				
2+30	0.3002	1.60	IQV				
2+35	0.3112	1.60	IQV				
2+40	0.3223	1.60	IQV				
2+45	0.3334	1.61	IQV				
2+50	0.3445	1.61	IQV				
2+55	0.3556	1.62	IQV				
3+ 0	0.3668	1.62	IQV				
3+ 5	0.3780	1.63	IQV				
3+10	0.3892	1.63	IQV				
3+15	0.4005	1.64	IQV				
3+20	0.4118	1.64	IQ V				
3+25	0.4232	1.65	IQ V				
3+30	0.4345	1.65	IQ V				
3+35	0.4459	1.66	IQ V				
3+40	0.4574	1.66	IQ V				
3+45	0.4688	1.67	IQ V				
3+50	0.4804	1.67	IQ V				
3+55	0.4919	1.68	IQ V				
4+ 0	0.5035	1.68	IQ V				
4+ 5	0.5151	1.69	IQ V				
4+10	0.5268	1.69	IQ V				
4+15	0.5384	1.70	IQ V				
4+20	0.5502	1.70	IQ V				
4+25	0.5619	1.71	IQ V				
4+30	0.5737	1.71	IQ V				
4+35	0.5856	1.72	IQ V				
4+40	0.5975	1.73	IQ V				
4+45	0.6094	1.73	IQ V				
4+50	0.6213	1.74	IQ V				
4+55	0.6333	1.74	IQ V				
5+ 0	0.6454	1.75	IQ V				
5+ 5	0.6575	1.75	IQ V				
5+10	0.6696	1.76	IQ V				
5+15	0.6818	1.77	IQ V				

5+20	0.6940	1.77	Q	V				
5+25	0.7062	1.78	Q	V				
5+30	0.7185	1.78	Q	V				
5+35	0.7308	1.79	Q	V				
5+40	0.7432	1.80	Q	V				
5+45	0.7556	1.80	Q	V				
5+50	0.7681	1.81	Q	V				
5+55	0.7806	1.82	Q	V				
6+ 0	0.7932	1.82	Q	V				
6+ 5	0.8058	1.83	Q	V				
6+10	0.8185	1.84	Q	V				
6+15	0.8312	1.84	Q	V				
6+20	0.8439	1.85	Q	V				
6+25	0.8567	1.86	Q	V				
6+30	0.8696	1.87	Q	V				
6+35	0.8825	1.87	Q	V				
6+40	0.8954	1.88	Q	V				
6+45	0.9084	1.89	Q	V				
6+50	0.9215	1.90	Q	V				
6+55	0.9346	1.90	Q	V				
7+ 0	0.9478	1.91	Q	V				
7+ 5	0.9610	1.92	Q	V				
7+10	0.9743	1.93	Q	V				
7+15	0.9876	1.94	Q	V				
7+20	1.0010	1.94	Q	V				
7+25	1.0144	1.95	Q	V				
7+30	1.0279	1.96	Q	V				
7+35	1.0415	1.97	Q	V				
7+40	1.0551	1.98	Q	V				
7+45	1.0688	1.99	Q	V				
7+50	1.0826	2.00	Q	V				
7+55	1.0964	2.00	Q	V				
8+ 0	1.1102	2.01	Q	V				
8+ 5	1.1242	2.02	Q	V				
8+10	1.1382	2.03	Q	V				
8+15	1.1522	2.04	Q	V				
8+20	1.1664	2.05	Q	V				
8+25	1.1806	2.06	Q	V				
8+30	1.1949	2.07	Q	V				
8+35	1.2092	2.08	Q	V				
8+40	1.2236	2.09	Q	V				
8+45	1.2381	2.10	Q	V				
8+50	1.2527	2.11	Q	V				
8+55	1.2673	2.13	Q	V				
9+ 0	1.2820	2.14	Q	V				
9+ 5	1.2968	2.15	Q	V				
9+10	1.3117	2.16	Q	V				
9+15	1.3267	2.17	Q	V				
9+20	1.3417	2.18	Q	V				
9+25	1.3568	2.20	Q	V				
9+30	1.3720	2.21	Q	V				
9+35	1.3873	2.22	Q	V				
9+40	1.4027	2.23	Q	V				
9+45	1.4182	2.25	Q	V				
9+50	1.4337	2.26	Q	V				
9+55	1.4494	2.27	Q	V				
10+ 0	1.4651	2.29	Q	V				
10+ 5	1.4810	2.30	Q	V				
10+10	1.4969	2.32	Q	V				
10+15	1.5130	2.33	Q	V				
10+20	1.5291	2.35	Q	V				
10+25	1.5454	2.36	Q	V				
10+30	1.5617	2.38	Q	V				

10+35	1.5782	2.39	Q	V			
10+40	1.5948	2.41	Q	V			
10+45	1.6115	2.42	Q	V			
10+50	1.6283	2.44	Q	V			
10+55	1.6452	2.46	Q	V			
11+ 0	1.6623	2.48	Q	V			
11+ 5	1.6795	2.50	Q	V			
11+10	1.6968	2.51	Q	V			
11+15	1.7142	2.53	Q	V			
11+20	1.7318	2.55	Q	V			
11+25	1.7495	2.57	Q	V			
11+30	1.7674	2.59	Q	V			
11+35	1.7854	2.61	Q	V			
11+40	1.8036	2.64	Q	V			
11+45	1.8219	2.66	Q	V			
11+50	1.8403	2.68	Q	V			
11+55	1.8590	2.70	Q	V			
12+ 0	1.8778	2.73	Q	V			
12+ 5	1.8964	2.71	Q	V			
12+10	1.9135	2.48	Q	V			
12+15	1.9290	2.25	Q	V			
12+20	1.9442	2.20	Q	V			
12+25	1.9594	2.21	Q	V			
12+30	1.9747	2.23	Q	V			
12+35	1.9903	2.26	Q	V			
12+40	2.0061	2.29	Q	V			
12+45	2.0221	2.32	Q	V			
12+50	2.0383	2.36	Q	V			
12+55	2.0548	2.39	Q	V			
13+ 0	2.0715	2.43	Q	V			
13+ 5	2.0885	2.46	Q	V			
13+10	2.1057	2.50	Q	V			
13+15	2.1232	2.54	Q	V			
13+20	2.1410	2.59	Q	V			
13+25	2.1592	2.63	Q	V			
13+30	2.1776	2.68	Q	V			
13+35	2.1964	2.73	Q	V			
13+40	2.2156	2.78	Q	V			
13+45	2.2351	2.83	Q	V			
13+50	2.2550	2.89	Q	V			
13+55	2.2753	2.95	Q	V			
14+ 0	2.2961	3.02	Q	V			
14+ 5	2.3174	3.09	Q	V			
14+10	2.3392	3.16	Q	V			
14+15	2.3615	3.24	Q	V			
14+20	2.3844	3.32	Q	V			
14+25	2.4079	3.41	Q	V			
14+30	2.4321	3.51	Q	V			
14+35	2.4570	3.61	Q	V			
14+40	2.4826	3.73	Q	V			
14+45	2.5091	3.85	Q	V			
14+50	2.5366	3.99	Q	V			
14+55	2.5651	4.13	Q	V			
15+ 0	2.5947	4.30	Q	V			
15+ 5	2.6255	4.48	Q	V			
15+10	2.6578	4.69	Q	V			
15+15	2.6917	4.92	Q	V			
15+20	2.7276	5.20	Q	V			
15+25	2.7654	5.49	Q	V			
15+30	2.8052	5.78	Q	V			
15+35	2.8475	6.14	Q	V			
15+40	2.8938	6.73	Q	V			
15+45	2.9454	7.50	Q	V			

15+50	3.0047	8.61			Q			V			
15+55	3.0752	10.23			Q			V			
16+ 0	3.1667	13.28				Q		V			
16+ 5	3.3122	21.14						Q	V		
16+10	3.5759	38.29							V		Q
16+15	3.8244	36.08							V		Q
16+20	3.9491	18.11				Q			V		
16+25	4.0173	9.91			Q				V		
16+30	4.0685	7.43			Q				V		
16+35	4.1086	5.83			Q				V		
16+40	4.1440	5.14			Q				V		
16+45	4.1759	4.63			Q				V		
16+50	4.2052	4.25			Q				V		
16+55	4.2324	3.94			Q				V		
17+ 0	4.2578	3.69			Q				V		
17+ 5	4.2817	3.48			Q				V		
17+10	4.3044	3.29			Q				V		
17+15	4.3260	3.13			Q				V		
17+20	4.3466	2.99			Q				V		
17+25	4.3664	2.87			Q				V		
17+30	4.3854	2.76			Q				V		
17+35	4.4037	2.66			Q				V		
17+40	4.4214	2.57			Q				V		
17+45	4.4386	2.49			Q				V		
17+50	4.4552	2.41			Q				V		
17+55	4.4713	2.34			Q				V		
18+ 0	4.4870	2.28			Q				V		
18+ 5	4.5026	2.27			Q				V		
18+10	4.5196	2.46			Q				V		
18+15	4.5379	2.66			Q				V		
18+20	4.5565	2.70			Q				V		
18+25	4.5748	2.66			Q				V		
18+30	4.5929	2.63			Q				V		
18+35	4.6107	2.58			Q				V		
18+40	4.6283	2.54			Q				V		
18+45	4.6455	2.51			Q				V		
18+50	4.6625	2.47			Q				V		
18+55	4.6793	2.43			Q				V		
19+ 0	4.6958	2.40			Q				V		
19+ 5	4.7122	2.37			Q				V		
19+10	4.7283	2.34			Q				V		
19+15	4.7442	2.31			Q				V		
19+20	4.7599	2.28			Q				V		
19+25	4.7754	2.25			Q				V		
19+30	4.7907	2.23			Q				V		
19+35	4.8059	2.20			Q				V		
19+40	4.8209	2.18			Q				V		
19+45	4.8358	2.15			Q				V		
19+50	4.8504	2.13			Q				V		
19+55	4.8650	2.11			Q				V		
20+ 0	4.8794	2.09			Q				V		
20+ 5	4.8936	2.07			Q				V		
20+10	4.9077	2.05			Q				V		
20+15	4.9217	2.03			Q				V		
20+20	4.9355	2.01			Q				V		
20+25	4.9493	1.99			Q				V		
20+30	4.9629	1.97			Q				V		
20+35	4.9763	1.96			Q				V		
20+40	4.9897	1.94			Q				V		
20+45	5.0029	1.92			Q				V		
20+50	5.0161	1.91			Q				V		
20+55	5.0291	1.89			Q				V		
21+ 0	5.0421	1.88			Q				V		

21+ 5	5.0549	1.86	IQ				V	
21+10	5.0676	1.85	IQ				V	
21+15	5.0803	1.83	IQ				V	
21+20	5.0928	1.82	IQ				V	
21+25	5.1053	1.81	IQ				V	
21+30	5.1176	1.79	IQ				V	
21+35	5.1299	1.78	IQ				V	
21+40	5.1421	1.77	IQ				V	
21+45	5.1542	1.76	IQ				V	
21+50	5.1662	1.75	IQ				V	
21+55	5.1782	1.73	IQ				V	
22+ 0	5.1900	1.72	IQ				V	
22+ 5	5.2018	1.71	IQ				V	
22+10	5.2135	1.70	IQ				V	
22+15	5.2252	1.69	IQ				V	
22+20	5.2367	1.68	IQ				V	
22+25	5.2482	1.67	IQ				V	
22+30	5.2596	1.66	IQ				V	
22+35	5.2710	1.65	IQ				V	
22+40	5.2823	1.64	IQ				V	
22+45	5.2935	1.63	IQ				V	
22+50	5.3047	1.62	IQ				V	
22+55	5.3158	1.61	IQ				V	
23+ 0	5.3268	1.60	IQ				V	
23+ 5	5.3378	1.59	IQ				V	
23+10	5.3487	1.58	IQ				V	
23+15	5.3595	1.58	IQ				V	
23+20	5.3703	1.57	IQ				V	
23+25	5.3811	1.56	IQ				V	
23+30	5.3918	1.55	IQ				V	
23+35	5.4024	1.54	IQ				V	
23+40	5.4130	1.54	IQ				V	
23+45	5.4235	1.53	IQ				V	
23+50	5.4340	1.52	IQ				V	
23+55	5.4444	1.51	IQ				V	
24+ 0	5.4547	1.51	IQ				V	
24+ 5	5.4643	1.39	IQ				V	
24+10	5.4700	0.82	Q				V	
24+15	5.4717	0.24	Q				V	
24+20	5.4720	0.05	Q				V	
24+25	5.4721	0.02	Q				V	

FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 06/01/21

6TH AND VICTORIA INDUSTRIAL, CITY OF HIGHLAND
100 YEAR STORM EVENT - PROPOSED CONDITION
BASIN ROUTING, 2998ROUTING
RP

Program License Serial Number 6145

***** HYDROGRAPH INFORMATION *****

From study/file name: 2998P100UH.rte
*****HYDROGRAPH DATA*****
Number of intervals = 293
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 38.285 (CFS)
Total volume = 5.472 (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 3.000 to Point/Station 4.000
**** RETARDING BASIN ROUTING ****

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 293
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00 (Ft.)

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)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.500	0.036	10.480	-0.000	0.072
1.500	0.147	10.480	0.111	0.183
2.500	0.285	10.480	0.249	0.321
3.500	0.435	10.480	0.399	0.471
4.500	0.590	10.480	0.554	0.626
5.500	0.746	10.480	0.710	0.782
6.500	0.896	10.480	0.860	0.932

7.500	1.034	10.480	0.998	1.070
8.500	1.144	10.480	1.108	1.180
9.000	1.181	10.480	1.145	1.217
10.000	1.182	10.480	1.146	1.218
11.000	1.183	10.480	1.147	1.219
12.000	1.184	12.640	1.140	1.228
12.500	1.185	14.790	1.134	1.236

Hydrograph Detention Basin Routing

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

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	9.6	19.14	28.71	38.29	Depth (Ft.)
0.083	0.11	0.05	0.000	O					0.00
0.167	0.67	0.39	0.001	O					0.02
0.250	1.25	0.96	0.003	OI					0.05
0.333	1.44	1.35	0.005	IO					0.06
0.417	1.48	1.46	0.005	IO					0.07
0.500	1.50	1.49	0.005	IO					0.07
0.583	1.50	1.50	0.005	IO					0.07
0.667	1.51	1.50	0.005	IO					0.07
0.750	1.51	1.51	0.005	IO					0.07
0.833	1.51	1.51	0.005	IO					0.07
0.917	1.52	1.52	0.005	IO					0.07
1.000	1.52	1.52	0.005	IO					0.07
1.083	1.53	1.52	0.005	IO					0.07
1.167	1.53	1.53	0.005	IO					0.07
1.250	1.53	1.53	0.005	IO					0.07
1.333	1.54	1.54	0.005	IO					0.07
1.417	1.54	1.54	0.005	IO					0.07
1.500	1.55	1.54	0.005	IO					0.07
1.583	1.55	1.55	0.005	IO					0.07
1.667	1.55	1.55	0.005	IO					0.07
1.750	1.56	1.56	0.005	IO					0.07
1.833	1.56	1.56	0.005	IO					0.07
1.917	1.57	1.56	0.005	IO					0.07
2.000	1.57	1.57	0.005	IO					0.07
2.083	1.57	1.57	0.005	IO					0.07
2.167	1.58	1.58	0.005	IO					0.08
2.250	1.58	1.58	0.005	IO					0.08
2.333	1.59	1.58	0.005	IO					0.08
2.417	1.59	1.59	0.005	IO					0.08
2.500	1.60	1.59	0.005	IO					0.08
2.583	1.60	1.60	0.005	IO					0.08
2.667	1.60	1.60	0.006	IO					0.08
2.750	1.61	1.61	0.006	IO					0.08
2.833	1.61	1.61	0.006	IO					0.08
2.917	1.62	1.62	0.006	IO					0.08
3.000	1.62	1.62	0.006	IO					0.08
3.083	1.63	1.62	0.006	IO					0.08
3.167	1.63	1.63	0.006	IO					0.08
3.250	1.64	1.63	0.006	IO					0.08
3.333	1.64	1.64	0.006	IO					0.08
3.417	1.65	1.64	0.006	IO					0.08
3.500	1.65	1.65	0.006	IO					0.08
3.583	1.66	1.65	0.006	IO					0.08
3.667	1.66	1.66	0.006	IO					0.08
3.750	1.67	1.66	0.006	IO					0.08
3.833	1.67	1.67	0.006	IO					0.08
3.917	1.68	1.67	0.006	IO					0.08
4.000	1.68	1.68	0.006	IO					0.08

4.083	1.69	1.68	0.006	10					0.08
4.167	1.69	1.69	0.006	10					0.08
4.250	1.70	1.69	0.006	10					0.08
4.333	1.70	1.70	0.006	10					0.08
4.417	1.71	1.71	0.006	10					0.08
4.500	1.71	1.71	0.006	10					0.08
4.583	1.72	1.72	0.006	10					0.08
4.667	1.73	1.72	0.006	10					0.08
4.750	1.73	1.73	0.006	10					0.08
4.833	1.74	1.73	0.006	10					0.08
4.917	1.74	1.74	0.006	10					0.08
5.000	1.75	1.75	0.006	10					0.08
5.083	1.75	1.75	0.006	10					0.08
5.167	1.76	1.76	0.006	10					0.08
5.250	1.77	1.76	0.006	10					0.08
5.333	1.77	1.77	0.006	10					0.08
5.417	1.78	1.78	0.006	10					0.08
5.500	1.78	1.78	0.006	10					0.09
5.583	1.79	1.79	0.006	10					0.09
5.667	1.80	1.79	0.006	10					0.09
5.750	1.80	1.80	0.006	10					0.09
5.833	1.81	1.81	0.006	10					0.09
5.917	1.82	1.81	0.006	10					0.09
6.000	1.82	1.82	0.006	10					0.09
6.083	1.83	1.83	0.006	10					0.09
6.167	1.84	1.83	0.006	10					0.09
6.250	1.84	1.84	0.006	10					0.09
6.333	1.85	1.85	0.006	10					0.09
6.417	1.86	1.86	0.006	10					0.09
6.500	1.87	1.86	0.006	10					0.09
6.583	1.87	1.87	0.006	10					0.09
6.667	1.88	1.88	0.006	10					0.09
6.750	1.89	1.88	0.006	10					0.09
6.833	1.90	1.89	0.007	10					0.09
6.917	1.90	1.90	0.007	10					0.09
7.000	1.91	1.91	0.007	10					0.09
7.083	1.92	1.92	0.007	10					0.09
7.167	1.93	1.92	0.007	10					0.09
7.250	1.94	1.93	0.007	10					0.09
7.333	1.94	1.94	0.007	10					0.09
7.417	1.95	1.95	0.007	10					0.09
7.500	1.96	1.96	0.007	10					0.09
7.583	1.97	1.97	0.007	10					0.09
7.667	1.98	1.97	0.007	10					0.09
7.750	1.99	1.98	0.007	10					0.09
7.833	2.00	1.99	0.007	10					0.10
7.917	2.00	2.00	0.007	10					0.10
8.000	2.01	2.01	0.007	10					0.10
8.083	2.02	2.02	0.007	10					0.10
8.167	2.03	2.03	0.007	10					0.10
8.250	2.04	2.04	0.007	10					0.10
8.333	2.05	2.05	0.007	10					0.10
8.417	2.06	2.06	0.007	10					0.10
8.500	2.07	2.07	0.007	10					0.10
8.583	2.08	2.08	0.007	10					0.10
8.667	2.09	2.09	0.007	10					0.10
8.750	2.10	2.10	0.007	10					0.10
8.833	2.11	2.11	0.007	10					0.10
8.917	2.13	2.12	0.007	10					0.10
9.000	2.14	2.13	0.007	10					0.10
9.083	2.15	2.14	0.007	10					0.10
9.167	2.16	2.15	0.007	10					0.10
9.250	2.17	2.17	0.007	10					0.10

9.333	2.18	2.18	0.007	O					0.10
9.417	2.20	2.19	0.008	O					0.10
9.500	2.21	2.20	0.008	O					0.11
9.583	2.22	2.21	0.008	O					0.11
9.667	2.23	2.23	0.008	O					0.11
9.750	2.25	2.24	0.008	O					0.11
9.833	2.26	2.25	0.008	O					0.11
9.917	2.27	2.27	0.008	O					0.11
10.000	2.29	2.28	0.008	O					0.11
10.083	2.30	2.29	0.008	O					0.11
10.167	2.32	2.31	0.008	O					0.11
10.250	2.33	2.32	0.008	O					0.11
10.333	2.35	2.34	0.008	O					0.11
10.417	2.36	2.35	0.008	O					0.11
10.500	2.38	2.37	0.008	O					0.11
10.583	2.39	2.38	0.008	O					0.11
10.667	2.41	2.40	0.008	O					0.11
10.750	2.42	2.42	0.008	O					0.12
10.833	2.44	2.43	0.008	O					0.12
10.917	2.46	2.45	0.008	O					0.12
11.000	2.48	2.47	0.008	O					0.12
11.083	2.50	2.49	0.009	O					0.12
11.167	2.51	2.50	0.009	O					0.12
11.250	2.53	2.52	0.009	O					0.12
11.333	2.55	2.54	0.009	O					0.12
11.417	2.57	2.56	0.009	O					0.12
11.500	2.59	2.58	0.009	O					0.12
11.583	2.61	2.60	0.009	O					0.12
11.667	2.64	2.63	0.009	O					0.13
11.750	2.66	2.65	0.009	O					0.13
11.833	2.68	2.67	0.009	O					0.13
11.917	2.70	2.69	0.009	O					0.13
12.000	2.73	2.72	0.009	O					0.13
12.083	2.71	2.72	0.009	O					0.13
12.167	2.48	2.60	0.009	O					0.12
12.250	2.25	2.37	0.008	O					0.11
12.333	2.20	2.22	0.008	O					0.11
12.417	2.21	2.20	0.008	O					0.11
12.500	2.23	2.22	0.008	O					0.11
12.583	2.26	2.25	0.008	O					0.11
12.667	2.29	2.28	0.008	O					0.11
12.750	2.32	2.31	0.008	O					0.11
12.833	2.36	2.34	0.008	O					0.11
12.917	2.39	2.37	0.008	O					0.11
13.000	2.43	2.41	0.008	O					0.11
13.083	2.46	2.45	0.008	O					0.12
13.167	2.50	2.48	0.009	O					0.12
13.250	2.54	2.52	0.009	O					0.12
13.333	2.59	2.57	0.009	O					0.12
13.417	2.63	2.61	0.009	O					0.12
13.500	2.68	2.66	0.009	O					0.13
13.583	2.73	2.70	0.009	O					0.13
13.667	2.78	2.75	0.009	O					0.13
13.750	2.83	2.81	0.010	O					0.13
13.833	2.89	2.86	0.010	O					0.14
13.917	2.95	2.92	0.010	O					0.14
14.000	3.02	2.99	0.010	O					0.14
14.083	3.09	3.05	0.010	O					0.15
14.167	3.16	3.12	0.011	O					0.15
14.250	3.24	3.20	0.011	O					0.15
14.333	3.32	3.28	0.011	O					0.16
14.417	3.41	3.37	0.012	O					0.16
14.500	3.51	3.46	0.012	O					0.17

14.583	3.61	3.56	0.012		OI							0.17
14.667	3.73	3.67	0.013		O							0.18
14.750	3.85	3.79	0.013		O							0.18
14.833	3.99	3.92	0.013		O							0.19
14.917	4.13	4.06	0.014		O							0.19
15.000	4.30	4.22	0.014		O							0.20
15.083	4.48	4.39	0.015		O							0.21
15.167	4.69	4.59	0.016		O							0.22
15.250	4.92	4.81	0.017		O							0.23
15.333	5.20	5.06	0.017		O							0.24
15.417	5.49	5.35	0.018		O							0.26
15.500	5.78	5.64	0.019		O							0.27
15.583	6.14	5.96	0.020		OI							0.28
15.667	6.73	6.43	0.022		O							0.31
15.750	7.50	7.11	0.024		OI							0.34
15.833	8.61	8.06	0.028		OI							0.38
15.917	10.23	9.42	0.032		OI							0.45
16.000	13.28	10.48	0.045		O	I						0.58
16.083	21.14	10.48	0.091		O		I					1.00
16.167	38.29	10.48	0.224		O					I		2.05
16.250	36.08	10.48	0.407		O					I		3.32
16.333	18.11	10.48	0.522		O		I					4.06
16.417	9.91	10.48	0.546		O							4.22
16.500	7.43	10.48	0.534		I O							4.14
16.583	5.83	10.48	0.507		I O							3.97
16.667	5.14	10.48	0.473		I O							3.74
16.750	4.63	10.48	0.434		I O							3.49
16.833	4.25	10.48	0.393		I O							3.22
16.917	3.94	10.48	0.349		I O							2.92
17.000	3.69	10.48	0.303		I O							2.62
17.083	3.48	10.48	0.255		I O							2.28
17.167	3.29	10.48	0.206		I O							1.93
17.250	3.13	10.48	0.156		I O							1.57
17.333	2.99	10.48	0.105		I O							1.12
17.417	2.87	10.48	0.053		I O							0.66
17.500	2.76	5.33	0.018		I O							0.25
17.583	2.66	2.71	0.009		O							0.13
17.667	2.57	2.62	0.009		O							0.12
17.750	2.49	2.53	0.009		O							0.12
17.833	2.41	2.45	0.008		O							0.12
17.917	2.34	2.38	0.008		O							0.11
18.000	2.28	2.31	0.008		O							0.11
18.083	2.27	2.27	0.008		O							0.11
18.167	2.46	2.36	0.008		OI							0.11
18.250	2.66	2.56	0.009		O							0.12
18.333	2.70	2.68	0.009		O							0.13
18.417	2.66	2.68	0.009		O							0.13
18.500	2.63	2.65	0.009		O							0.13
18.583	2.58	2.61	0.009		O							0.12
18.667	2.54	2.56	0.009		O							0.12
18.750	2.51	2.53	0.009		O							0.12
18.833	2.47	2.49	0.009		O							0.12
18.917	2.43	2.45	0.008		O							0.12
19.000	2.40	2.42	0.008		O							0.12
19.083	2.37	2.39	0.008		O							0.11
19.167	2.34	2.35	0.008		O							0.11
19.250	2.31	2.32	0.008		O							0.11
19.333	2.28	2.30	0.008		O							0.11
19.417	2.25	2.27	0.008		O							0.11
19.500	2.23	2.24	0.008		O							0.11
19.583	2.20	2.22	0.008		O							0.11
19.667	2.18	2.19	0.008		O							0.10
19.750	2.15	2.17	0.007		O							0.10

19.833	2.13	2.14	0.007	IO					0.10
19.917	2.11	2.12	0.007	IO					0.10
20.000	2.09	2.10	0.007	IO					0.10
20.083	2.07	2.08	0.007	IO					0.10
20.167	2.05	2.06	0.007	IO					0.10
20.250	2.03	2.04	0.007	IO					0.10
20.333	2.01	2.02	0.007	IO					0.10
20.417	1.99	2.00	0.007	IO					0.10
20.500	1.97	1.98	0.007	IO					0.09
20.583	1.96	1.97	0.007	IO					0.09
20.667	1.94	1.95	0.007	IO					0.09
20.750	1.92	1.93	0.007	IO					0.09
20.833	1.91	1.92	0.007	IO					0.09
20.917	1.89	1.90	0.007	IO					0.09
21.000	1.88	1.89	0.006	IO					0.09
21.083	1.86	1.87	0.006	IO					0.09
21.167	1.85	1.86	0.006	IO					0.09
21.250	1.83	1.84	0.006	IO					0.09
21.333	1.82	1.83	0.006	IO					0.09
21.417	1.81	1.81	0.006	IO					0.09
21.500	1.79	1.80	0.006	IO					0.09
21.583	1.78	1.79	0.006	IO					0.09
21.667	1.77	1.78	0.006	IO					0.08
21.750	1.76	1.76	0.006	IO					0.08
21.833	1.75	1.75	0.006	IO					0.08
21.917	1.73	1.74	0.006	IO					0.08
22.000	1.72	1.73	0.006	IO					0.08
22.083	1.71	1.72	0.006	IO					0.08
22.167	1.70	1.71	0.006	IO					0.08
22.250	1.69	1.70	0.006	IO					0.08
22.333	1.68	1.68	0.006	IO					0.08
22.417	1.67	1.67	0.006	IO					0.08
22.500	1.66	1.66	0.006	IO					0.08
22.583	1.65	1.65	0.006	IO					0.08
22.667	1.64	1.64	0.006	IO					0.08
22.750	1.63	1.63	0.006	IO					0.08
22.833	1.62	1.63	0.006	IO					0.08
22.917	1.61	1.62	0.006	IO					0.08
23.000	1.60	1.61	0.006	IO					0.08
23.083	1.59	1.60	0.005	IO					0.08
23.167	1.58	1.59	0.005	IO					0.08
23.250	1.58	1.58	0.005	IO					0.08
23.333	1.57	1.57	0.005	IO					0.07
23.417	1.56	1.56	0.005	IO					0.07
23.500	1.55	1.56	0.005	IO					0.07
23.583	1.54	1.55	0.005	IO					0.07
23.667	1.54	1.54	0.005	IO					0.07
23.750	1.53	1.53	0.005	IO					0.07
23.833	1.52	1.52	0.005	IO					0.07
23.917	1.51	1.52	0.005	IO					0.07
24.000	1.51	1.51	0.005	IO					0.07
24.083	1.39	1.45	0.005	IO					0.07
24.167	0.82	1.11	0.004	O					0.05
24.250	0.24	0.53	0.002	O					0.03
24.333	0.05	0.15	0.000	O					0.01
24.417	0.02	0.04	0.000	O					0.00
24.500	0.00	0.01	0.000	O					0.00

*****HYDROGRAPH DATA*****

Number of intervals = 294

Time interval = 5.0 (Min.)

Maximum/Peak flow rate = 10.480 (CFS)

Total volume = 5.472 (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

Appendix D
Soil Group Map and Isohyetal Map

STORMWATER FACILITY MAPPING TOOL

TDC Choose search item from list: Enter Value Locate Clear

Clear All Metadata

- Base Maps
- Base Data
- Stormwater Data
- Habitat/Species

Identify Features

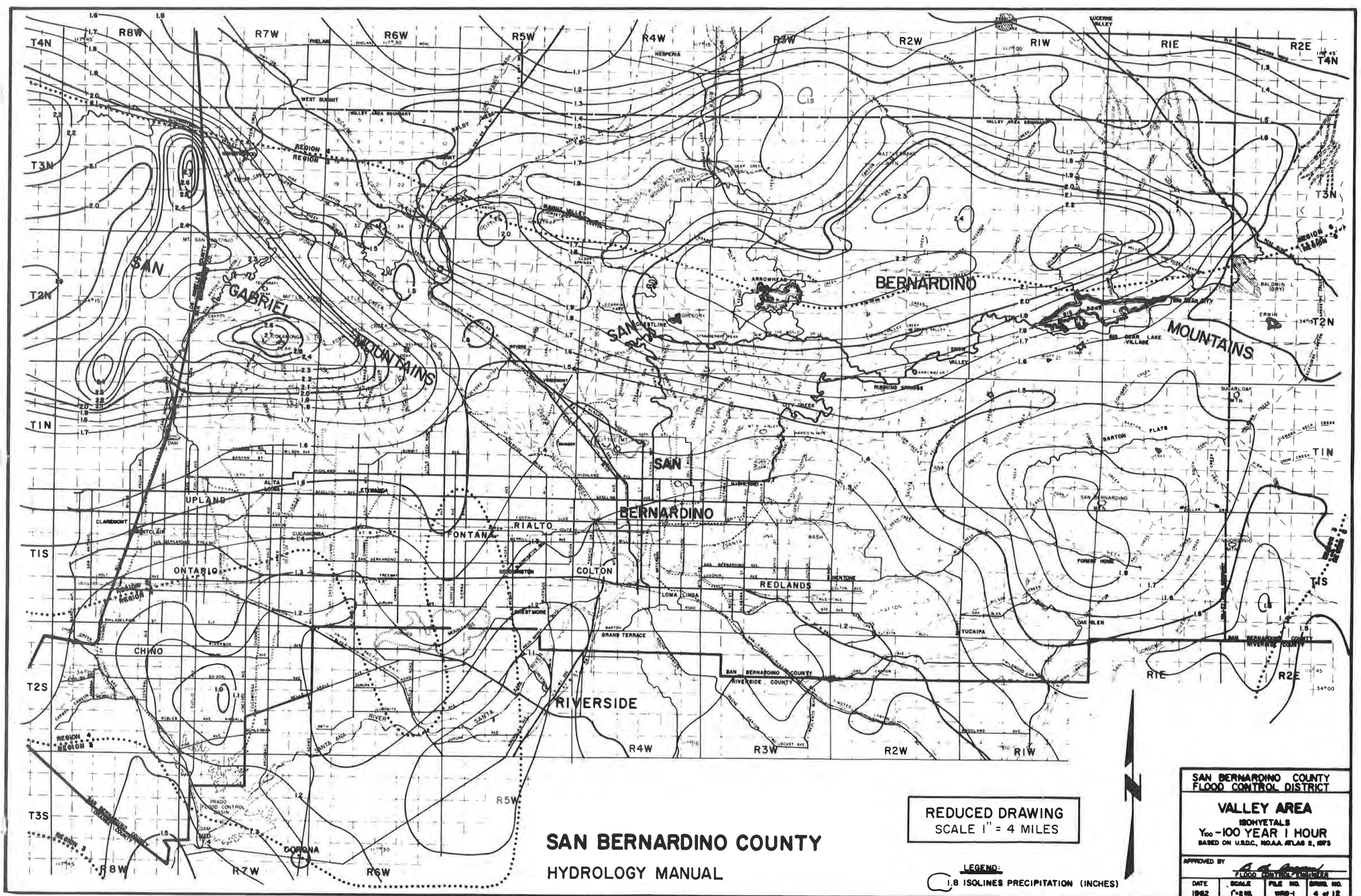
Click on map to view data.

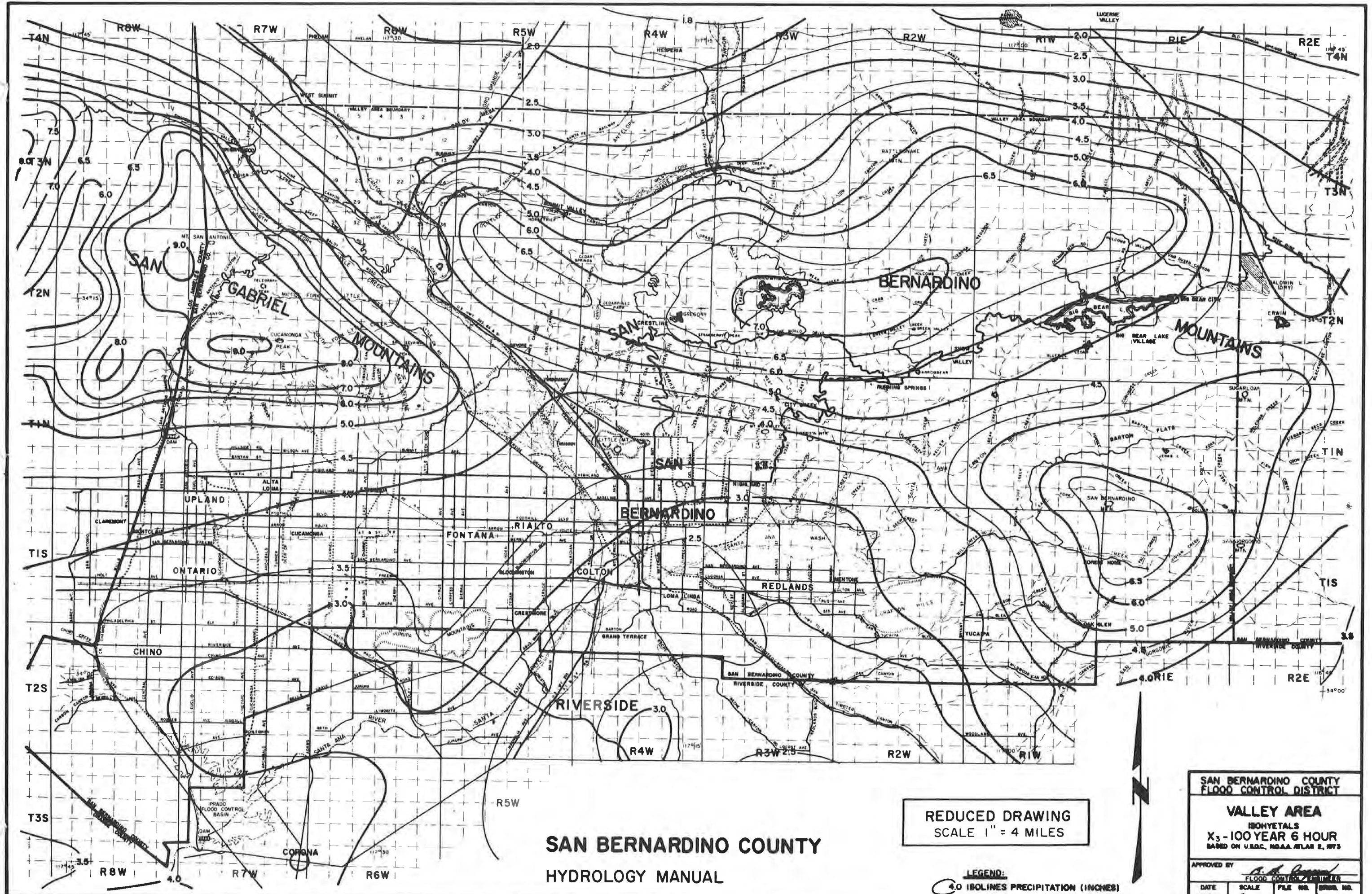
CA677 (Soils)

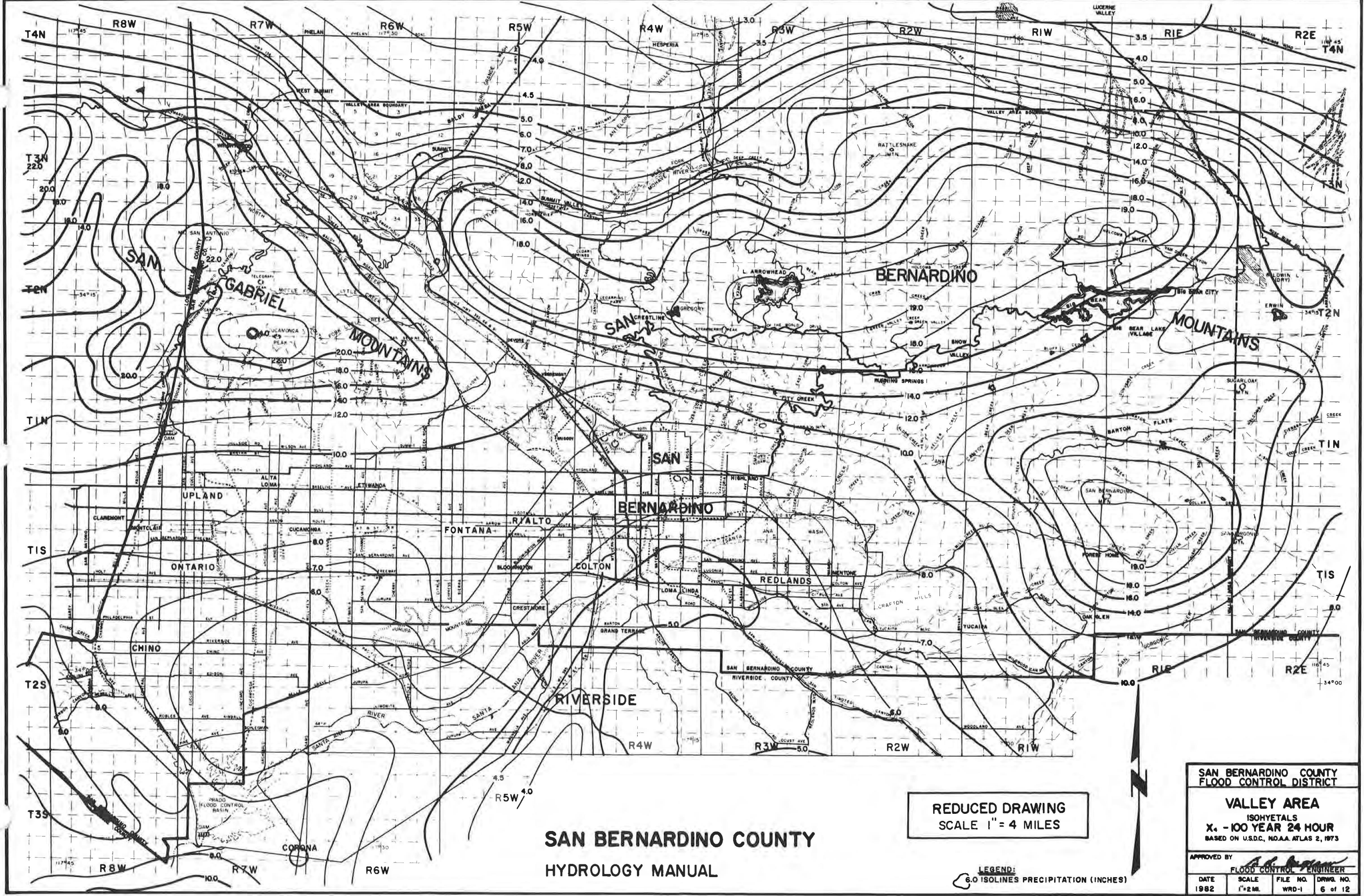
OBJECTID_12	129
OBJECTID_1	129
OBJECTID	129
AREASYMBOL	CA677
SPATIALVER	1
MUSYM	HaC
MUKEY	457966
Soil_Type	HaC HANFORD COARSE SA
HYDGRP	B
ABV	HANFORD COARSE SANDY
Shape	Polygon
Shape.STArea()	7196745.690481
Shape.STLength()	12336.383312

0.05 Miles

RBF GIS







**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

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

LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT**

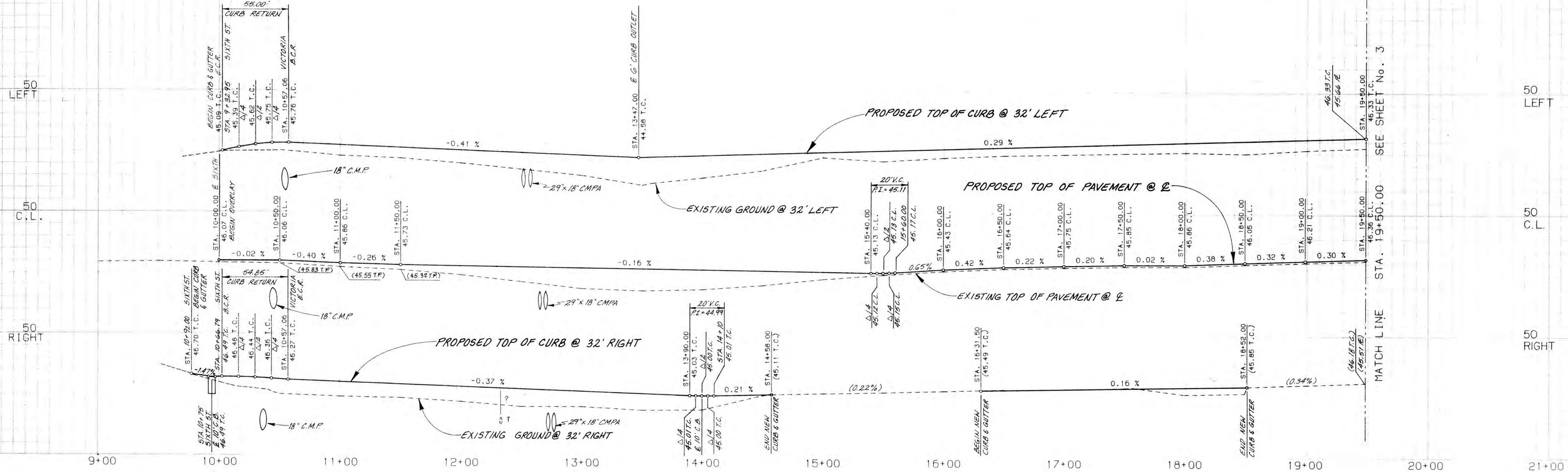
VALLEY AREA
ISOHYETALS
X4 - 100 YEAR 24 HOUR
BASED ON U.S.D.C. NO. AA. ATLAS 2, 1973

APPROVED BY *[Signature]*
FLOOD CONTROL ENGINEER

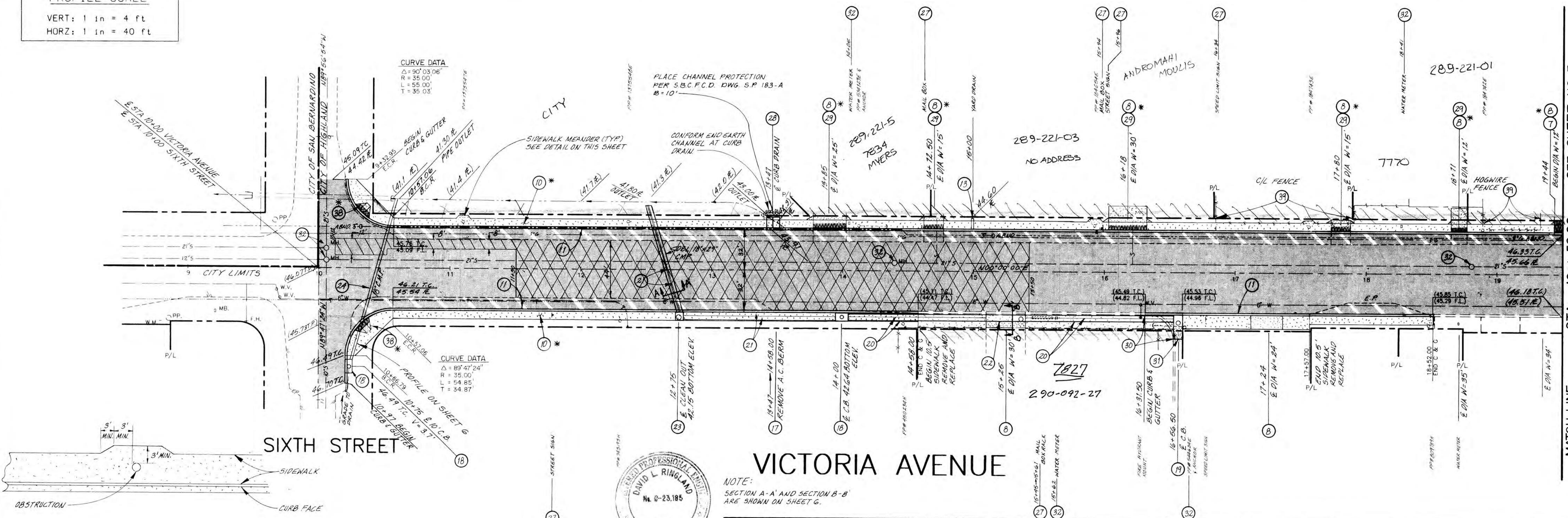
DATE 1982	SCALE 1" = 2 MI.	FILE NO. WRD-1	DRWG. NO. 6 of 12
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Appendix E

Selected References



PROFILE SCALE
 VERT: 1 in = 4 ft
 HORZ: 1 in = 40 ft



SIDEWALK MEANDER DETAIL
 N.T.S.

* DENOTES ALTERNATE BID ITEM



NOTE:
 SECTION A-A AND SECTION B-B
 ARE SHOWN ON SHEET 6.

PLANS PREPARED BY: C G Engineering 25814 Business Center Dr. Suite A Redlands, CA 92374 (714) 799-8844 Planning and Engineering		FIELD BOOK REFERENCE:		CITY OF HIGHLAND DESIGNED BY: M.J.F. DRAWN BY: M.D.G. CHECKED BY: D.L.R. APPROVED BY:		STREET IMPROVEMENT PLAN VICTORIA AVENUE STA 10+00 TO STA 19+50		W.C. NO. ROAD NO. FILE NO.
DAVID L. RINGLAND R.C.E. 23185 EXP 12/31/93		REVISIONS APPR. DATE		DATE 4-7-93 CITY ENGINEER R.C.E. 37415 EXP 6/30/92		SHEET 2 OF 7		

CONSTRUCTION NOTES ARE
 ON SHEET 1.

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