Final

Drainage Report

For

Tract No. 20547

Victorville, CA

Prepared
January 2025

United Engineering Group - California
10601 Church Street
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Provided for:

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Suite 110
Victorville, CA 92395

Project # 30212

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any employees that have provided data and calculations upon which the recommendations, conclusions, and decisions are based.

Christopher F. Lenz, PE 63001

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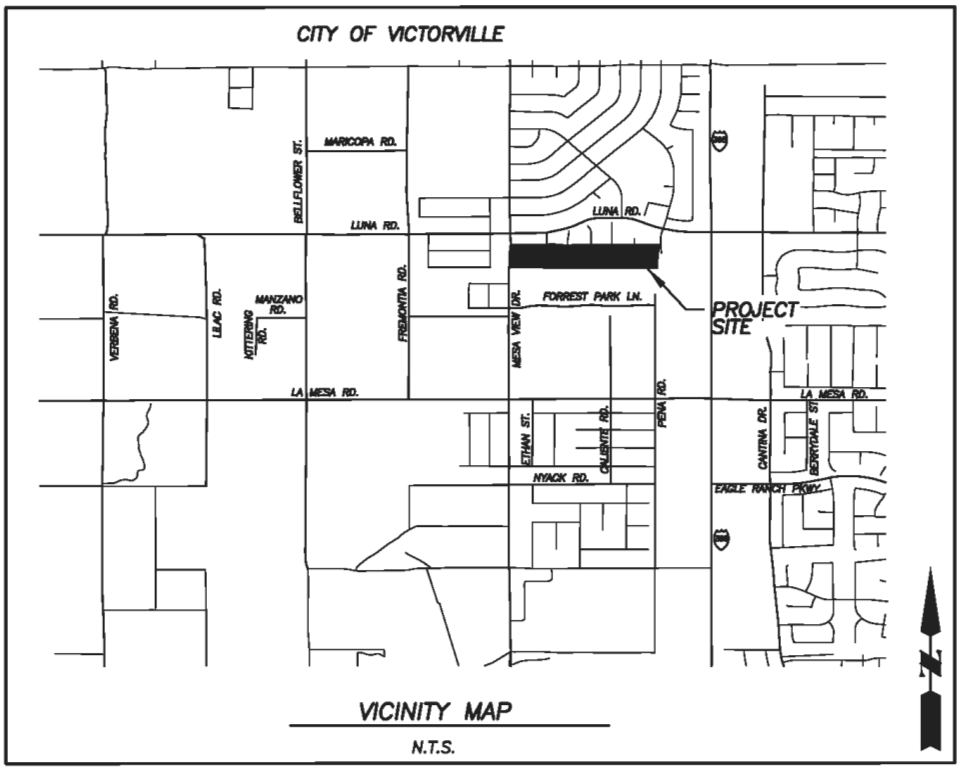
I. INTRODUCTION

Tract 20547 is a residential subdivision of approximately 15 acres into 54 single family residential lots, located near the southeast corner of Luna Road and Mesa View Drive in the City of Victorville. The property is a long rectangle shape and is bordered by the existing development on all sides. Minimum lot size is 7,200 sf. This is a "priority project" as it is a Tract Map, and thus a WQMP is required.



The purpose of this study is to determine the 10-year and 100-year storm runoff emanating from on-site and off-site areas for the Project, and to show how the subdivision handles storm water. The study will determine the peak flow rate for the existing condition, the peak flow rate for the proposed condition, proposed condition flow rate routed through two combination water quality and detention basins. Additional analysis will confirm hydraulic capacity of proposed street sections compared to rational expected runoff.

The scope of the study includes the following:

- Determination of points of flow concentration and watershed areas.
- Determination of the 100-year 24 hours storm runoff based upon the onsite drainage conditions utilizing the San Bernardino County Flood Control District (SBCFCD) SCS Unit Hydrograph Method.
- Determination of the 10-year and 100-year peak flow rates for the offsite area utilizing the San Bernardino County Flood Control District

(SBCFCD) Rational Method.

II. SITE DISCUSSION

The current property is vacant, undeveloped and undisturbed land with uniform slope of approximately 1.5 percent. The topography indicates that the runoff drains in an easterly direction in the form of sheet flow. There is no evidence of defined washes on site, with the flow concentrating at the northeast corner of the site before discharging northerly in Pena Road. The site is surrounded by development and is not impacted by offsite flows.

III. RAINFALL DATA

The San Bernardino County Flood Control District (SBCFCD) hydrology Manual, (Reference 1) was used to develop the hydrological parameters for the 10-year and 100-year storm events. The Rational Method was used to determine the peak flow rates associated with the existing project conditions as well as the time of concentration used in the Unit Hydrograph method. In addition, the Unit Hydrograph Method was utilized to determine the runoff volume. Computations were performed using the CivilCADD drainage software for San Bernardino County Developed by CivilDesign Corporation.

Rainfall data was taken from the isohyetal maps from the SBCFCD hydrology Manual.

Return Period – Duration	Isohyetal (in)
10 year – 1 hour	0.69
2 year – 6 hour	0.89
2 year – 24 hour	1.64
100 year – 1 hour	1.29
100 year – 6 hour	2.51
100 year – 24 hour	5.41

Hydrologic Soil Group “A” and an Antecedent Moisture Conditions (AMC) 2 (10yr) and 3 (100yr) are used for the study area. The proposed condition percentage impervious is 40, and the SCS runoff is 32. Refer to Appendix B for additional detail.

The project's runoff is designed to be contained in one basin that will act as both water quality infiltration, and flood storage for peak runoff mitigation. The 100- year 24 runoff event is the limiting factor for design.

IV. ONSITE RUNOFF

Existing Condition/Pre Development

The runoff from the subject site in the existing condition is primarily sheet flow, and the one concentration of flow has been analyzed. The sites 15 acres drains northeasterly to the western side of Pena Road and continues northerly. It is shown as Area A and Nodes 101 to 103 on the Existing Conditions Drainage Exhibit in Appendix A. The peak flow rate is 17.92 cfs and flood volume is 1.73 ac-ft.

Proposed Condition/Post Development

The proposed condition is to utilize one basin for water quality and flood routing for the project. The Rational method was prepared for determination of time of concentration for use in the development of the Unit Hydrographs. The post development 100 year 24 hour runoff is 24.3 cfs and 3.55 ac-ft.

The post development runoff is routed through the proposed basin to confirm post development runoff could be mitigated to less than pre-development runoff. The basin is designed to be dual purpose retention and detention basins with the bottom one (1) to one and a half (1.5) feet supplying the required water quality retention and infiltration the WQMP design storms. The overall basin storage volume is used for peak runoff mitigation. A Spillway has been designed to control the outlet. The Basin has a preliminary designed 6' wide spillway at 1' deep. The following is the detail for the basin shown on the TTM;

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
1.000	0.253	0.720	0.251	0.255
2.000	0.536	0.720	0.534	0.538
3.000	0.850	0.720	0.848	0.852
4.000	1.200	13.725	1.153	1.247

After routing through the proposed basins the post development 100 year 24 hour runoff for Area A is 13.1 cfs with 1.18 ac-ft stored. Weir designs were used for calculations of the spillways. Refer to Appendices B and C for detailed output files and the Tract Rough Grading Plans.

The primary hydraulic design elements are the roads, curb openings, storm drain, and the weir structure outleting from the basin. Roads within the project will be used to carry runoff. At the minimum design slope of 0.5%

the roads can carry 37 cfs within the curbs and 52 cfs within the right-of-way. All sub areas are within the 37 and 52 cfs capacity of the street. The runoff from area A is collected by a catch basin and storm drain line. The catch basin is in a sump condition and will be designed at final design. The outlet from the catch basin is carried by a 36" pipe to the basin.

V. OFFSITE RUNOFF

The site is surrounded by development and is not impacted by offsite flows.

VI. STORMWATER TREATMENT

Stormwater treatment will be provided by the bottom of the proposed basin, where the required volume will infiltrate into the groundwater. The basin exceeds the required water quality volume. Water quality calculations were prepared based on the San Bernardino County Model Water Quality Management Plan Guidance document. The following calculations were used in sizing of facilities;

- WQ Contributing area – 14.55 Acres
- 2 yr 1 hour rainfall – 0.40"
- Impervious ratio – 40% (from SBCFCD hydrology Manual)
- $C_{BMP} = 0.28$
- Drainage Area Region – Desert – Regression Coefficient $P_6 = 1.2371$
- $P_6 = 1.2371 \times 0.40" = 0.49"$
- Regression Constant a = 1.963 for 48 hours
- $P_0 = a * C_{BMP} * P_6 = 1.963 \times 0.28 \times 0.49 = 0.272$
- $V_0 = (P_0 * A)/12$
    - $V = (0.272 \times 14.55)/12 = 0.33$ acft

VII. CONCLUSION

The proposed development of tract 20547, a 15 acre, 54 lots single family detached subdivision can be mitigated as designed and analyzed in this report to be compatible with the City of Victorville Master Plan of Drainage. The development of the subject site will not change area drainage patterns, impact any of the surrounding properties, or change any of the regional master plan facilities. The site will construct a combination retention and detention basin of sufficient size to handle water quality through infiltration, and flood mitigation through detention. The streets have been analyzed and confirmed to contain the 10 year runoff within the curb, and the 100 year runoff within the right of way. The basin and outlet structure has been designed and analyzed in conjunction with the TTM and street grades to confirm capacity to adequately handle the design storm runoff.

REFERENCES

1. San Bernardino County Flood Control and Water Conservation District Hydrology Manual, August 1986.

2. Master Plan of Drainage for Oro Grande Wash and Adjacent Watersheds that are Tributary to the Mojave River, Williamson & Schmid, March 1992.

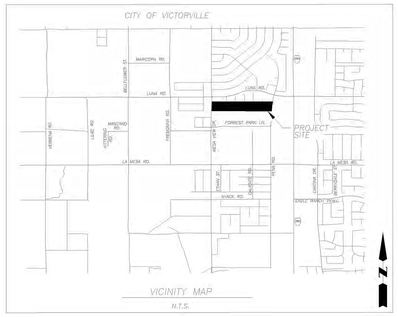
APPENDIX A:
PROJECT PRE AND POST CONDITION EXHIBITS

IN THE CITY OF VICTORVILLE, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.

DRAINAGE EXISTING CONDITION EXHIBIT TTM 20547

PARCELS 2, 3 AND 4 OF PARCEL MAP NO. 2619, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 23 OF PARCEL MAPS, PAGE 44, RECORDS OF SAID COUNTY

UNITED ENGINEERING GROUP CA., INC JANUARY 2025



VICINITY MAP
N.T.S.

LEGEND

- FLOWLINE
- CONTRIBUTORY AREA BOUNDARY
- TRACT BOUNDARY
- A2 / 22.4 — SUB AREA IDENTIFIER / AREA (ACRES)
- 302 / 1752 — NODE/CONCENTRATION POINT / FLOWLINE ELEVATION

CALCULATED Tc FROM RATIONALE = 33.9 MIN
(USED IN UNIT HYDROGRAPH CALCULATIONS)

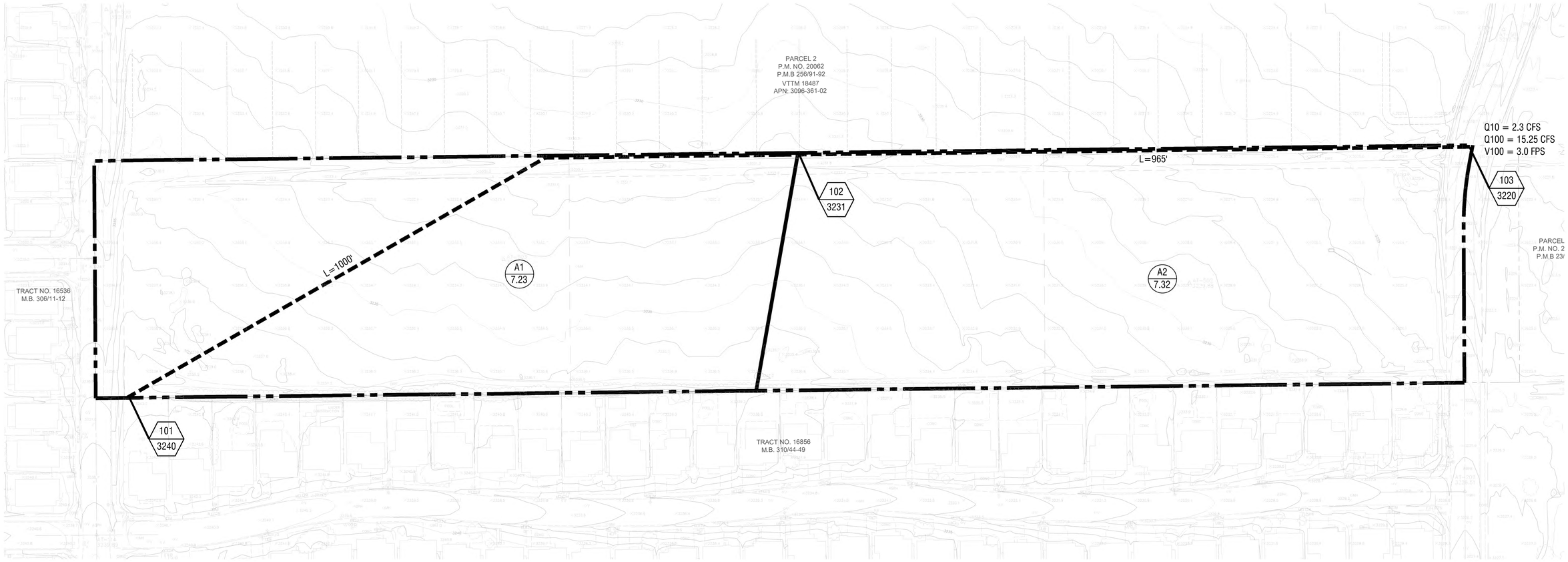
GENERAL NOTES:

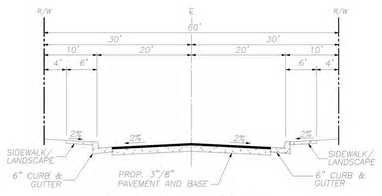
1. ASSESSOR'S PARCEL NOS.: 3096-361-05, -06 & -07.
2. THE PROPERTY SHOWN HEREIN CONTAINS THE ENTIRE CONTIGUOUS OWNERSHIP.
3. TOTAL GROSS AREA = 658,917 SQ. FT., 15.13 ACRES
4. TOTAL NET AREA = 627,023 SQ. FT., 14.39 ACRES
5. TOTAL NO. OF NUMBERED LOTS = 54
6. TOTAL NO. OF LETTERED LOTS = 2
7. LOTS 1 THROUGH 54 ARE 7,200 S.F. MIN. (RESIDENTIAL LOTS)
8. NET DENSITY: 3.75 DU/AC.
9. GROSS DENSITY: 3.57 DU/AC.
10. AVERAGE LOT SIZE = 8,611 S.F.
11. CONTOUR INTERVAL = 1 FOOT (VARIES)
12. ALL SLOPES ARE 2:1 OR FLATTER
13. LOT DIMENSIONS SHOWN HEREIN ARE APPROXIMATE.
14. THIS MAP IS COMPILED FROM RECORD INFORMATION ONLY AND IS NOT TO BE USED AS A BOUNDARY SURVEY.
15. THE LOCATIONS OF ALL EXISTING UTILITIES SHOWN ON THIS MAP ARE APPROXIMATE.
16. ALL FRONT YARD BUILDING SETBACK LINES (BSL) ARE SHOWN AT THE MINIMUM FRONT YARD BSL = 20'.

LAND USE INFORMATION:

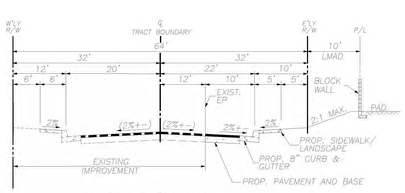
EXISTING ZONING = R-1/R-1T4 (SINGLE FAMILY RESIDENTIAL)
PROPOSED ZONING = R-1/R-1T4 (SINGLE FAMILY RESIDENTIAL)

ADJACENT EXISTING LAND USE
NORTH – R-1T4 (SINGLE FAMILY RESIDENTIAL)
EAST – C-1 (NEIGHBORHOOD RETAIL)
WEST – SP2-91 (VISTA VERDE SPECIFIC PLAN)
SOUTH – R-1T4 (SINGLE FAMILY RESIDENTIAL)

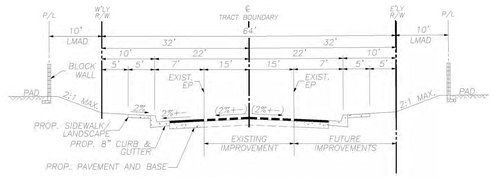




TYPICAL LOCAL STREET SECTION
N.T.S.



MESA VIEW DRIVE SECTION
N.T.S.



PENA ROAD SECTION
N.T.S.

BENCHMARK:

CITY OF VICTORVILLE BENCHMARK NO. V-223, IN TC 5" E/O N/E BOR MESA LINDA AND EUCALYPTUS.
ELEV = 3376.91

PREPARED BY:

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APPLICANT/OWNER:

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3RD FLOOR
SANTA MONICA, CA 90401

N

50' 0' 50' 100'
GRAPHIC SCALE: 1"=50'

SUBMITTALS:	REVISIONS		
	NO.	DESCRIPTION	DATE
DESIGNED BY:			
DRAWN BY:			
CHECKED BY:			

REGISTERED PROFESSIONAL ENGINEER CHRISTOPHER F. LENZ NO. 63001 EXP. 6/30/26 CIVIL STATE OF CALIFORNIA

CHRISTOPHER F. LENZ DATE
R.C.E. No. 63001

LICENSED LAND SURVEYOR DEAN C. PHILLIPS EXP. 9/30/25 NO. 6974 STATE OF CALIFORNIA

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OLIVERA & PENA

VESTING TTM NO. 20547
EXISTING CONDITION EXHIBIT

JANUARY 2025
SHEET 1 OF 1
PROJECT NUMBER
CA-30212

IN THE CITY OF VICTORVILLE, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA.

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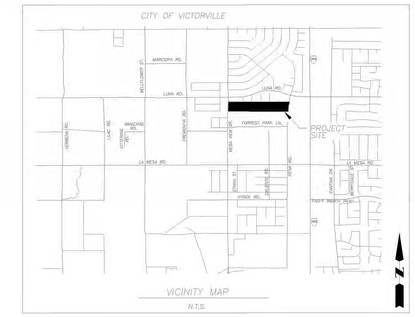

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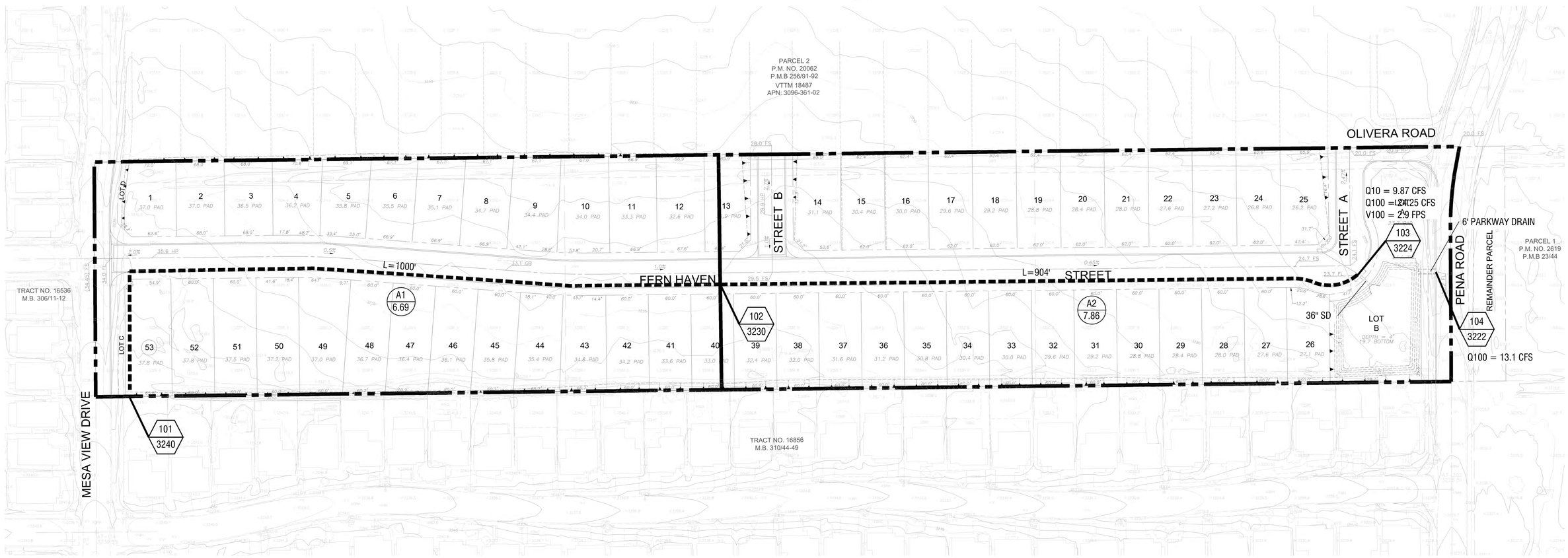

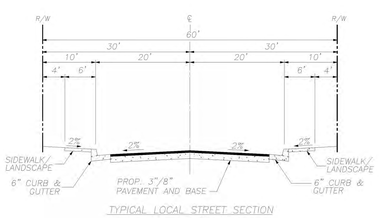

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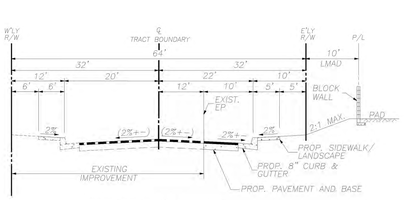

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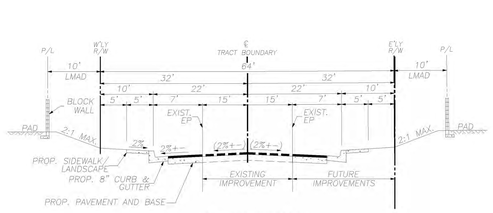

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OLIVERA & PENA

VESTING TTM NO. 20547
PROPOSED CONDITION EXHIBIT

JANUARY 2025

SHEET 1 OF 1

PROJECT NUMBER
CA-30212

APPENDIX B:
PROJECT RATIONAL
SCS UNIT HYDROGRAPH
HYDROLOGY STUDY INFORMATION

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.4862°, Longitude: -117.4113°
Elevation: 3257.47 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 Trypaluk, 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

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.078 (0.064-0.095)	0.112 (0.093-0.137)	0.158 (0.130-0.194)	0.195 (0.159-0.241)	0.245 (0.194-0.314)	0.284 (0.220-0.371)	0.324 (0.244-0.433)	0.364 (0.267-0.501)	0.419 (0.295-0.601)	0.462 (0.314-0.685)
10-min	0.111 (0.092-0.136)	0.161 (0.133-0.197)	0.226 (0.186-0.278)	0.279 (0.228-0.346)	0.352 (0.278-0.450)	0.407 (0.315-0.532)	0.464 (0.350-0.621)	0.522 (0.383-0.718)	0.601 (0.423-0.862)	0.662 (0.450-0.982)
15-min	0.135 (0.111-0.165)	0.195 (0.161-0.238)	0.274 (0.225-0.336)	0.338 (0.276-0.418)	0.425 (0.336-0.544)	0.493 (0.381-0.643)	0.561 (0.424-0.751)	0.631 (0.464-0.869)	0.727 (0.512-1.04)	0.800 (0.544-1.19)
30-min	0.204 (0.169-0.249)	0.295 (0.243-0.361)	0.414 (0.341-0.508)	0.511 (0.418-0.632)	0.643 (0.508-0.823)	0.745 (0.576-0.973)	0.849 (0.641-1.14)	0.955 (0.701-1.31)	1.10 (0.774-1.58)	1.21 (0.824-1.80)
60-min	0.276 (0.228-0.337)	0.399 (0.330-0.488)	0.561 (0.462-0.688)	0.692 (0.565-0.856)	0.871 (0.688-1.11)	1.01 (0.781-1.32)	1.15 (0.868-1.54)	1.29 (0.949-1.78)	1.49 (1.05-2.13)	1.64 (1.12-2.43)
2-hr	0.388 (0.321-0.474)	0.528 (0.436-0.646)	0.718 (0.591-0.881)	0.878 (0.717-1.09)	1.10 (0.872-1.41)	1.28 (0.993-1.68)	1.47 (1.11-1.97)	1.67 (1.23-2.30)	1.95 (1.37-2.79)	2.17 (1.48-3.22)
3-hr	0.488 (0.403-0.596)	0.652 (0.538-0.797)	0.878 (0.723-1.08)	1.07 (0.875-1.33)	1.35 (1.07-1.73)	1.57 (1.22-2.05)	1.81 (1.37-2.42)	2.07 (1.52-2.85)	2.43 (1.71-3.49)	2.73 (1.86-4.05)
6-hr	0.669 (0.553-0.817)	0.885 (0.731-1.08)	1.19 (0.980-1.46)	1.46 (1.19-1.80)	1.85 (1.46-2.36)	2.17 (1.68-2.83)	2.51 (1.90-3.36)	2.89 (2.12-3.98)	3.45 (2.43-4.94)	3.91 (2.66-5.80)
12-hr	0.834 (0.690-1.02)	1.15 (0.949-1.41)	1.60 (1.31-1.96)	1.98 (1.62-2.45)	2.55 (2.02-3.26)	3.02 (2.34-3.95)	3.53 (2.67-4.73)	4.09 (3.00-5.63)	4.90 (3.45-7.03)	5.58 (3.80-8.29)
24-hr	1.14 (1.01-1.31)	1.64 (1.46-1.89)	2.35 (2.08-2.72)	2.97 (2.60-3.46)	3.87 (3.28-4.66)	4.61 (3.83-5.67)	5.41 (4.38-6.81)	6.29 (4.95-8.14)	7.56 (5.72-10.2)	8.62 (6.30-12.0)
2-day	1.23 (1.09-1.41)	1.76 (1.56-2.02)	2.51 (2.22-2.90)	3.17 (2.77-3.69)	4.13 (3.50-4.98)	4.94 (4.10-6.07)	5.82 (4.71-7.33)	6.78 (5.34-8.78)	8.20 (6.20-11.1)	9.39 (6.86-13.1)
3-day	1.31 (1.16-1.51)	1.86 (1.65-2.14)	2.64 (2.33-3.05)	3.33 (2.92-3.88)	4.34 (3.68-5.23)	5.19 (4.31-6.38)	6.12 (4.96-7.71)	7.14 (5.63-9.25)	8.65 (6.54-11.7)	9.92 (7.24-13.9)
4-day	1.41 (1.25-1.63)	1.99 (1.76-2.30)	2.82 (2.49-3.26)	3.55 (3.11-4.14)	4.63 (3.92-5.58)	5.53 (4.59-6.80)	6.51 (5.27-8.20)	7.59 (5.98-9.84)	9.19 (6.95-12.4)	10.5 (7.69-14.7)
7-day	1.54 (1.36-1.77)	2.15 (1.90-2.47)	3.01 (2.66-3.48)	3.77 (3.31-4.40)	4.89 (4.14-5.89)	5.81 (4.82-7.15)	6.81 (5.52-8.58)	7.91 (6.23-10.2)	9.52 (7.19-12.8)	10.9 (7.93-15.2)
10-day	1.64 (1.46-1.89)	2.28 (2.02-2.63)	3.19 (2.82-3.69)	3.98 (3.49-4.64)	5.14 (4.36-6.19)	6.10 (5.06-7.50)	7.13 (5.78-8.98)	8.26 (6.51-10.7)	9.90 (7.48-13.4)	11.3 (8.23-15.7)
20-day	1.99 (1.77-2.30)	2.75 (2.44-3.17)	3.82 (3.37-4.41)	4.75 (4.16-5.53)	6.11 (5.18-7.36)	7.22 (6.00-8.88)	8.42 (6.82-10.6)	9.73 (7.66-12.6)	11.6 (8.77-15.7)	13.2 (9.61-18.4)
30-day	2.34 (2.07-2.69)	3.20 (2.83-3.68)	4.41 (3.90-5.10)	5.47 (4.79-6.38)	7.02 (5.95-8.45)	8.29 (6.88-10.2)	9.65 (7.82-12.2)	11.1 (8.76-14.4)	13.2 (10.0-17.9)	15.0 (10.9-20.9)
45-day	2.75 (2.44-3.16)	3.71 (3.28-4.27)	5.07 (4.48-5.86)	6.26 (5.48-7.29)	8.00 (6.78-9.63)	9.43 (7.82-11.6)	11.0 (8.87-13.8)	12.6 (9.93-16.3)	15.0 (11.3-20.2)	16.9 (12.4-23.6)
60-day	3.10 (2.75-3.56)	4.12 (3.65-4.75)	5.58 (4.93-6.45)	6.85 (6.00-7.98)	8.72 (7.39-10.5)	10.3 (8.51-12.6)	11.9 (9.64-15.0)	13.7 (10.8-17.7)	16.2 (12.3-21.9)	18.3 (13.4-25.6)

[1] 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.

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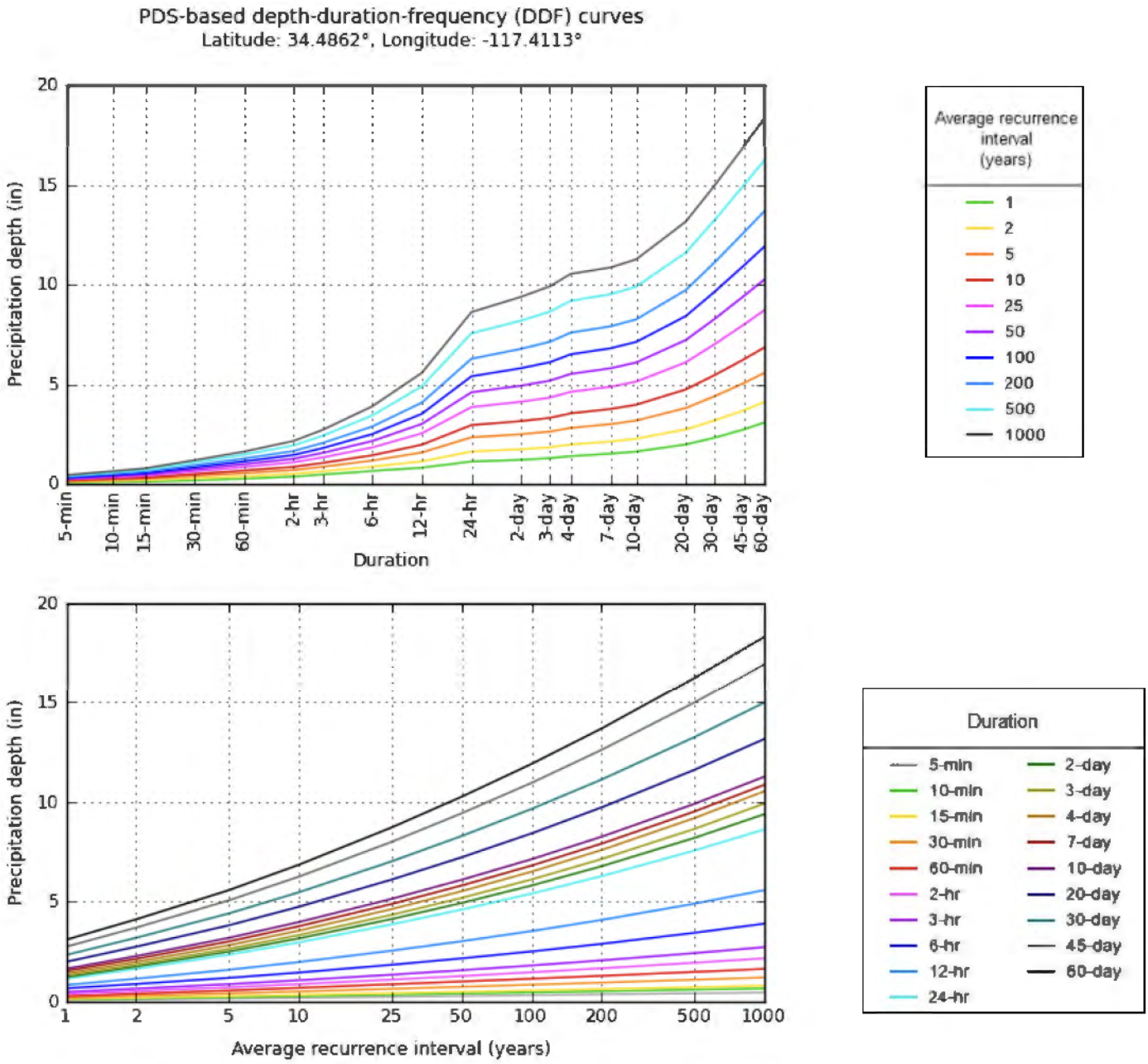
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Wed Oct 20 17:44:29 2021

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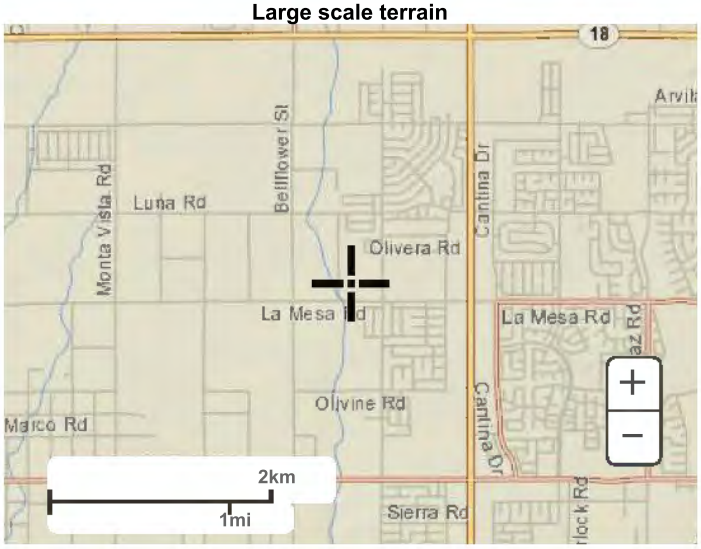
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map

Large scale aerial

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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

Disclaimer

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

Figure C-4

San Bernardino County, California, Mojave River Area

112—CAJON SAND, 0 TO 2 PERCENT SLOPES

Map Unit Setting

National map unit symbol: hkrj
Elevation: 1,800 to 3,200 feet
Mean annual precipitation: 3 to 6 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 180 to 290 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cajon and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cajon

Setting

Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite sources

Typical profile

H1 - 0 to 7 inches: sand
H2 - 7 to 25 inches: sand
H3 - 25 to 45 inches: gravelly sand
H4 - 45 to 60 inches: stratified sand to loamy fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XF012CA - Sandy
Hydric soil rating: No

Minor Components

Manet
Percent of map unit: 5 percent
Landform: Playas
Hydric soil rating: Yes

Kimberlina
Percent of map unit: 5 percent

Helendale
Percent of map unit: 5 percent

Data Source Information

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 13, Sep 13, 2021

Soil Map—San Bernardino County, California, Mojave River Area
(Olivera and Pena)

Map Scale: 1:3,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County, California, Mojave River Area
Survey Area Data: Version 13, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 27, 2021—May 24, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
112	CAJON SAND, 0 TO 2 PERCENT SLOPES	13.2	100.0%
Totals for Area of Interest		**13.2**	**100.0%**

```
                  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: 07/08/22
      ------------------------------------------------------------------
------
      Olivera and Pena
      Existing Condition
      10yr

      ------------------------------------------------------------------
------


      Program License Serial Number 6232

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

      ------------------------------------------------------------------
------
      Rational hydrology study storm event year is    10.0
      Computed rainfall intensity:
      Storm year =    10.00   1 hour rainfall =     0.692 (In.)
      Slope used for rainfall intensity curve b =  0.7000
      Soil antecedent moisture condition (AMC) = 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ___________________________________________________________________
____
      UNDEVELOPED (average cover) subarea
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 50.00
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810
(In/Hr)
      Initial subarea data:
      Initial area flow distance =  1000.000(Ft.)
      Top (of initial area) elevation =  3240.000(Ft.)
      Bottom (of initial area) elevation =  3231.000(Ft.)
      Difference in elevation =     9.000(Ft.)
      Slope =    0.00900  s(%)=       0.90
      TC = k(0.706)*[(length^3)/(elevation change)]^0.2
      Initial area time of concentration =   28.705 min.
      Rainfall intensity =      1.159(In/Hr) for a    10.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.272
      Subarea runoff =      2.277(CFS)
      Total initial stream area =        7.230(Ac.)
```

```
      Pervious area fraction = 1.000
      Initial area Fm value =    0.810(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      102.000 to Point/Station
103.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.422(Ft.), Average velocity =   1.858(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              1.00
            2              4.00              0.00
            3             14.00              1.00
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      2.313(CFS)
        '     '    flow top width =      5.904(Ft.)
        '     '    velocity=    1.858(Ft/s)
        '     '    area =      1.245(Sq.Ft)
        '     '    Froude number =     0.713

      Upstream point elevation =  3231.000(Ft.)
      Downstream point elevation =  3220.000(Ft.)
      Flow length =   965.000(Ft.)
      Travel time  =    8.66 min.
      Time of concentration =   37.36 min.
      Depth of flow =   0.422(Ft.)
      Average velocity =   1.858(Ft/s)
      Total irregular channel flow =     2.313(CFS)
      Irregular channel normal depth above invert elev. =   0.422(Ft.)
      Average velocity of channel(s) =   1.858(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (average cover) subarea
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 50.00
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.810
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      2.024(CFS)
      therefore the upstream flow rate of Q =      2.277(CFS) is being
used
      Rainfall intensity =      0.964(In/Hr) for a    10.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.144
      Subarea runoff =      0.000(CFS) for    7.320(Ac.)
      Total runoff =      2.277(CFS)
      Effective area this stream =       14.55(Ac.)
      Total Study Area (Main Stream No. 1) =       14.55(Ac.)
      Area averaged Fm value =    0.810(In/Hr)
```

```
Depth of flow =   0.419(Ft.), Average velocity =   1.851(Ft/s)
End of computations, Total Study Area =           14.55 (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(Ap) = 1.000
Area averaged SCS curve number =  50.0
```

```
                  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: 07/08/22
      ------------------------------------------------------------------
------
      Olivera and Pena
      Existing Condition
      100 yr

      ------------------------------------------------------------------
------


      Program License Serial Number 6232

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

      ------------------------------------------------------------------
------
      Rational hydrology study storm event year is   100.0
      Computed rainfall intensity:
      Storm year =   100.00   1 hour rainfall =     1.150 (In.)
      Slope used for rainfall intensity curve b =  0.7000
      Soil antecedent moisture condition (AMC) = 3


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________
____
      UNDEVELOPED (average cover) subarea
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 50.00
      Adjusted SCS curve number for AMC 3 = 70.00
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.532
(In/Hr)
      Initial subarea data:
      Initial area flow distance =  1000.000(Ft.)
      Top (of initial area) elevation =  3240.000(Ft.)
      Bottom (of initial area) elevation =  3231.000(Ft.)
      Difference in elevation =     9.000(Ft.)
      Slope =    0.00900  s(%)=       0.90
      TC = k(0.706)*[(length^3)/(elevation change)]^0.2
      Initial area time of concentration =   28.705 min.
      Rainfall intensity =      1.927(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.651
      Subarea runoff =      9.073(CFS)
```

```
      Total initial stream area =        7.230(Ac.)
      Pervious area fraction = 1.000
      Initial area Fm value =    0.532(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      102.000 to Point/Station
103.000
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ______________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.786(Ft.), Average velocity =   2.815(Ft/s)
            ******* Irregular Channel Data ***********
      ----------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              1.00
            2              4.00              0.00
            3             14.00              1.00
      Manning's 'N' friction factor =   0.030
      ----------------------------------------------------------------
      Sub-Channel flow  =     12.187(CFS)
        '     '    flow top width =     11.010(Ft.)
        '     '    velocity=    2.815(Ft/s)
        '     '    area =      4.329(Sq.Ft)
        '     '    Froude number =     0.791

      Upstream point elevation =  3231.000(Ft.)
      Downstream point elevation =  3220.000(Ft.)
      Flow length =   965.000(Ft.)
      Travel time  =    5.71 min.
      Time of concentration =   34.42 min.
      Depth of flow =   0.786(Ft.)
      Average velocity =   2.815(Ft/s)
      Total irregular channel flow =    12.187(CFS)
      Irregular channel normal depth above invert elev. =   0.786(Ft.)
      Average velocity of channel(s) =   2.815(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (average cover) subarea
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 50.00
      Adjusted SCS curve number for AMC 3 = 70.00
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.532
(In/Hr)
      Rainfall intensity =      1.697(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.618
      Subarea runoff =      6.175(CFS) for    7.320(Ac.)
      Total runoff =     15.248(CFS)
      Effective area this stream =       14.55(Ac.)
      Total Study Area (Main Stream No. 1) =       14.55(Ac.)
      Area averaged Fm value =    0.532(In/Hr)
      Depth of flow =   0.855(Ft.), Average velocity =   2.977(Ft/s)
      End of computations, Total Study Area =           14.55 (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(Ap) = 1.000
Area averaged SCS curve number = 50.0

```
                  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: 07/08/22
      ------------------------------------------------------------------
------
      Olivera and Pena
      Proposed Condition
      10 yr

      ------------------------------------------------------------------
------


      Program License Serial Number 6232

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

      ------------------------------------------------------------------
------
      Rational hydrology study storm event year is    10.0
      Computed rainfall intensity:
      Storm year =    10.00   1 hour rainfall =     0.692 (In.)
      Slope used for rainfall intensity curve b =  0.7000
      Soil antecedent moisture condition (AMC) = 2


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________
____
      RESIDENTIAL(3 - 4 dwl/acre)
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 32.00
      Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.587
(In/Hr)
      Initial subarea data:
      Initial area flow distance =  1000.000(Ft.)
      Top (of initial area) elevation =  3240.000(Ft.)
      Bottom (of initial area) elevation =  3230.000(Ft.)
      Difference in elevation =    10.000(Ft.)
      Slope =    0.01000  s(%)=       1.00
      TC = k(0.412)*[(length^3)/(elevation change)]^0.2
      Initial area time of concentration =   16.402 min.
      Rainfall intensity =      1.715(In/Hr) for a    10.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.592
      Subarea runoff =      6.796(CFS)
      Total initial stream area =        6.690(Ac.)
```

```
      Pervious area fraction = 0.600
      Initial area Fm value =    0.587(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      102.000 to Point/Station
103.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ______________________________________________________________________
____
      Top of street segment elevation =  3230.000(Ft.)
      End of street segment elevation =  3224.000(Ft.)
      Length of street segment  =   904.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  18.000(Ft.)
      Distance from crown to crossfall grade break  =  16.000(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [2] side(s) of the street
      Distance from curb to property line  =  12.000(Ft.)
      Slope from curb to property line (v/hz) =   0.030
      Gutter width =   2.000(Ft.)
      Gutter hike from flowline =  2.000(In.)
       Manning's N in gutter =  0.0150
       Manning's N from gutter to grade break =  0.0150
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =      8.426(CFS)
      Depth of flow =   0.396(Ft.), Average velocity =   2.174(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =  13.459(Ft.)
      Flow velocity =   2.17(Ft/s)
      Travel time =    6.93 min.     TC =   23.33  min.
       Adding area flow to street
      RESIDENTIAL(3 - 4 dwl/acre)
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 32.00
      Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.587
(In/Hr)
      Rainfall intensity =      1.340(In/Hr) for a    10.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.506
      Subarea runoff =      3.073(CFS) for    7.860(Ac.)
      Total runoff =      9.870(CFS)
      Effective area this stream =       14.55(Ac.)
      Total Study Area (Main Stream No. 1) =       14.55(Ac.)
      Area averaged Fm value =    0.587(In/Hr)
      Street flow at end of street =      9.870(CFS)
      Half street flow at end of street =      4.935(CFS)
      Depth of flow =   0.414(Ft.), Average velocity =   2.258(Ft/s)
      Flow width (from curb towards crown)=  14.349(Ft.)
      End of computations, Total Study Area =           14.55 (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(Ap) = 0.600
Area averaged SCS curve number =  32.0
```

```
                  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: 07/08/22
      ------------------------------------------------------------------
------
      Olivera and Pena
      Proposed Condition
      100 year

      ------------------------------------------------------------------
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      Program License Serial Number 6232

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

      ------------------------------------------------------------------
------
      Rational hydrology study storm event year is   100.0
      Computed rainfall intensity:
      Storm year =   100.00   1 hour rainfall =     1.150 (In.)
      Slope used for rainfall intensity curve b =  0.7000
      Soil antecedent moisture condition (AMC) = 3


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      101.000 to Point/Station
102.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________
____
      RESIDENTIAL(3 - 4 dwl/acre)
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 32.00
      Adjusted SCS curve number for AMC 3 = 52.00
      Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.471
(In/Hr)
      Initial subarea data:
      Initial area flow distance =  1000.000(Ft.)
      Top (of initial area) elevation =  3240.000(Ft.)
      Bottom (of initial area) elevation =  3230.000(Ft.)
      Difference in elevation =    10.000(Ft.)
      Slope =    0.01000  s(%)=       1.00
      TC = k(0.412)*[(length^3)/(elevation change)]^0.2
      Initial area time of concentration =   16.402 min.
      Rainfall intensity =      2.851(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.751
      Subarea runoff =     14.329(CFS)
```

```
      Total initial stream area =        6.690(Ac.)
      Pervious area fraction = 0.600
      Initial area Fm value =    0.471(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station      102.000 to Point/Station
103.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
____
      Top of street segment elevation =  3230.000(Ft.)
      End of street segment elevation =  3224.000(Ft.)
      Length of street segment  =   904.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  18.000(Ft.)
      Distance from crown to crossfall grade break  =  16.000(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [2] side(s) of the street
      Distance from curb to property line  =  12.000(Ft.)
      Slope from curb to property line (v/hz) =   0.030
      Gutter width =   2.000(Ft.)
      Gutter hike from flowline =  2.000(In.)
       Manning's N in gutter =  0.0150
       Manning's N from gutter to grade break =  0.0150
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =     19.355(CFS)
      Depth of flow =   0.499(Ft.), Average velocity =   2.701(Ft/s)
      Note:  depth of flow exceeds top of street crown.
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =  18.000(Ft.)
      Flow velocity =   2.70(Ft/s)
      Travel time =    5.58 min.     TC =   21.98  min.
       Adding area flow to street
      RESIDENTIAL(3 - 4 dwl/acre)
      Decimal fraction soil group A = 1.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 0.000
      SCS curve number for soil(AMC 2)  = 32.00
      Adjusted SCS curve number for AMC 3 = 52.00
      Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.471
(In/Hr)
      Rainfall intensity =      2.323(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.717
      Subarea runoff =      9.917(CFS) for    7.860(Ac.)
      Total runoff =     24.246(CFS)
      Effective area this stream =       14.55(Ac.)
      Total Study Area (Main Stream No. 1) =       14.55(Ac.)
      Area averaged Fm value =    0.471(In/Hr)
      Street flow at end of street =     24.246(CFS)
      Half street flow at end of street =     12.123(CFS)
      Depth of flow =   0.532(Ft.), Average velocity =   2.891(Ft/s)
      Warning: depth of flow exceeds top of curb
      Note:  depth of flow exceeds top of street crown.
      Distance that curb overflow reaches into property =    1.06(Ft.)
```

Flow width (from curb towards crown)= 18.000(Ft.)
End of computations, Total Study Area = 14.55 (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(Ap) = 0.600
Area averaged SCS curve number = 32.0

U n i t   H y d r o g r a p h   A n a l y s i s

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Study date 07/08/22

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

Program License Serial Number 6232

Olivera and Pena
Proposed Condition
100 yr

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		
14.55	1	1.15
Rainfall data for year 100		
14.55	6	2.51
Rainfall data for year 100		
14.55	24	5.41

++

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


      SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap
Fm
      No.(AMCII) NO.(AMC 3)    (Ac.)    Fraction     (In/Hr)  (dec.)
(In/Hr)
       32.0      52.0         14.55      1.000     0.785    0.600
0.471

      Area-averaged adjusted loss rate Fm (In/Hr) =  0.471

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

      Area       Area          SCS CN    SCS CN      S     Pervious
       (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
           8.73   0.600         32.0      52.0       9.23     0.183
           5.82   0.400         98.0      98.0       0.20     0.956

      Area-averaged catchment yield fraction, Y =  0.493
      Area-averaged low loss fraction, Yb =  0.507
      User entry of time of concentration  =   0.425 (hours)
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Watershed area =      14.55(Ac.)
      Catchment Lag time =   0.340 hours
      Unit interval =   5.000 minutes
      Unit interval percentage of lag time = 24.5098
      Hydrograph baseflow =     0.00(CFS)
      Average maximum watershed loss rate(Fm) =  0.471(In/Hr)
      Average low loss rate fraction (Yb) = 0.507 (decimal)
      DESERT S-Graph Selected
      Computed peak 5-minute rainfall =  0.546(In)
      Computed peak 30-minute rainfall =  0.934(In)
      Specified peak 1-hour rainfall =  1.150(In)
      Computed peak 3-hour rainfall =  1.856(In)
      Specified peak 6-hour rainfall =  2.510(In)
      Specified peak 24-hour rainfall =  5.410(In)


      Rainfall depth area reduction factors:
      Using a total area of      14.55(Ac.) (Ref: fig. E-4)

      5-minute factor = 0.999     Adjusted rainfall =  0.545(In)
      30-minute factor = 0.999    Adjusted rainfall =  0.933(In)
      1-hour factor = 0.999       Adjusted rainfall =  1.149(In)
      3-hour factor = 1.000       Adjusted rainfall =  1.856(In)
      6-hour factor = 1.000       Adjusted rainfall =  2.510(In)
      24-hour factor = 1.000      Adjusted rainfall =  5.410(In)
      ----------------------------------------------------------------
---

                       U n i t  H y d r o g r a p h
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Interval          'S' Graph          Unit Hydrograph
      Number            Mean values             ((CFS))
      ----------------------------------------------------------------
---
                  (K =       175.96 (CFS))
```

1	1.314	2.312
2	6.356	8.873
3	18.675	21.676
4	40.035	37.586
5	55.063	26.445
6	64.261	16.184
7	70.664	11.268
8	75.535	8.572
9	79.389	6.781
10	82.438	5.365
11	85.000	4.509
12	87.240	3.941
13	89.068	3.218
14	90.526	2.565
15	91.851	2.332
16	93.011	2.041
17	94.037	1.806
18	94.883	1.488
19	95.677	1.396
20	96.326	1.144
21	96.928	1.059
22	97.385	0.804
23	97.796	0.722
24	98.060	0.465
25	98.312	0.443
26	98.600	0.508
27	98.894	0.518
28	99.188	0.518
29	99.469	0.494
30	99.644	0.308
31	99.797	0.270
32	100.000	0.135

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.5453	0.5453
2	0.6714	0.1260
3	0.7582	0.0868
4	0.8265	0.0683
5	0.8838	0.0572
6	0.9335	0.0497
7	0.9776	0.0442
8	1.0176	0.0400
9	1.0542	0.0366
10	1.0880	0.0339
11	1.1196	0.0316
12	1.1492	0.0296
13	1.1900	0.0408
14	1.2291	0.0391
15	1.2667	0.0375
16	1.3029	0.0362
17	1.3378	0.0349
18	1.3715	0.0338
19	1.4043	0.0327
20	1.4360	0.0318
21	1.4669	0.0309
22	1.4970	0.0301
23	1.5263	0.0293

24	1.5549	0.0286
25	1.5828	0.0279
26	1.6101	0.0273
27	1.6369	0.0267
28	1.6630	0.0262
29	1.6887	0.0256
30	1.7138	0.0252
31	1.7385	0.0247
32	1.7628	0.0242
33	1.7866	0.0238
34	1.8100	0.0234
35	1.8330	0.0230
36	1.8557	0.0227
37	1.8780	0.0223
38	1.8999	0.0219
39	1.9215	0.0216
40	1.9428	0.0213
41	1.9639	0.0210
42	1.9846	0.0207
43	2.0050	0.0204
44	2.0252	0.0202
45	2.0451	0.0199
46	2.0648	0.0197
47	2.0843	0.0194
48	2.1035	0.0192
49	2.1224	0.0190
50	2.1412	0.0188
51	2.1598	0.0186
52	2.1781	0.0183
53	2.1963	0.0182
54	2.2142	0.0180
55	2.2320	0.0178
56	2.2496	0.0176
57	2.2670	0.0174
58	2.2842	0.0172
59	2.3013	0.0171
60	2.3182	0.0169
61	2.3350	0.0168
62	2.3516	0.0166
63	2.3680	0.0165
64	2.3843	0.0163
65	2.4005	0.0162
66	2.4165	0.0160
67	2.4324	0.0159
68	2.4482	0.0158
69	2.4638	0.0156
70	2.4793	0.0155
71	2.4946	0.0154
72	2.5099	0.0152
73	2.5291	0.0193
74	2.5483	0.0191
75	2.5673	0.0190
76	2.5862	0.0189
77	2.6050	0.0188
78	2.6237	0.0187
79	2.6423	0.0186
80	2.6607	0.0185
81	2.6791	0.0184
82	2.6974	0.0183
83	2.7156	0.0182

84	2.7336	0.0181
85	2.7516	0.0180
86	2.7695	0.0179
87	2.7873	0.0178
88	2.8050	0.0177
89	2.8226	0.0176
90	2.8401	0.0175
91	2.8576	0.0174
92	2.8749	0.0174
93	2.8922	0.0173
94	2.9094	0.0172
95	2.9265	0.0171
96	2.9435	0.0170
97	2.9605	0.0169
98	2.9773	0.0169
99	2.9941	0.0168
100	3.0109	0.0167
101	3.0275	0.0166
102	3.0441	0.0166
103	3.0606	0.0165
104	3.0770	0.0164
105	3.0933	0.0164
106	3.1096	0.0163
107	3.1259	0.0162
108	3.1420	0.0162
109	3.1581	0.0161
110	3.1741	0.0160
111	3.1901	0.0160
112	3.2059	0.0159
113	3.2218	0.0158
114	3.2375	0.0158
115	3.2532	0.0157
116	3.2689	0.0156
117	3.2845	0.0156
118	3.3000	0.0155
119	3.3155	0.0155
120	3.3309	0.0154
121	3.3462	0.0153
122	3.3615	0.0153
123	3.3767	0.0152
124	3.3919	0.0152
125	3.4070	0.0151
126	3.4221	0.0151
127	3.4371	0.0150
128	3.4521	0.0150
129	3.4670	0.0149
130	3.4819	0.0149
131	3.4967	0.0148
132	3.5115	0.0148
133	3.5262	0.0147
134	3.5408	0.0147
135	3.5554	0.0146
136	3.5700	0.0146
137	3.5845	0.0145
138	3.5990	0.0145
139	3.6134	0.0144
140	3.6278	0.0144
141	3.6421	0.0143
142	3.6564	0.0143
143	3.6707	0.0142

144	3.6849	0.0142
145	3.6990	0.0142
146	3.7131	0.0141
147	3.7272	0.0141
148	3.7412	0.0140
149	3.7552	0.0140
150	3.7691	0.0139
151	3.7830	0.0139
152	3.7969	0.0139
153	3.8107	0.0138
154	3.8245	0.0138
155	3.8382	0.0137
156	3.8519	0.0137
157	3.8656	0.0137
158	3.8792	0.0136
159	3.8928	0.0136
160	3.9063	0.0135
161	3.9199	0.0135
162	3.9333	0.0135
163	3.9468	0.0134
164	3.9602	0.0134
165	3.9735	0.0134
166	3.9868	0.0133
167	4.0001	0.0133
168	4.0134	0.0133
169	4.0266	0.0132
170	4.0398	0.0132
171	4.0529	0.0131
172	4.0660	0.0131
173	4.0791	0.0131
174	4.0922	0.0130
175	4.1052	0.0130
176	4.1181	0.0130
177	4.1311	0.0129
178	4.1440	0.0129
179	4.1569	0.0129
180	4.1697	0.0128
181	4.1826	0.0128
182	4.1953	0.0128
183	4.2081	0.0128
184	4.2208	0.0127
185	4.2335	0.0127
186	4.2462	0.0127
187	4.2588	0.0126
188	4.2714	0.0126
189	4.2840	0.0126
190	4.2965	0.0125
191	4.3090	0.0125
192	4.3215	0.0125
193	4.3340	0.0125
194	4.3464	0.0124
195	4.3588	0.0124
196	4.3712	0.0124
197	4.3835	0.0123
198	4.3958	0.0123
199	4.4081	0.0123
200	4.4204	0.0123
201	4.4326	0.0122
202	4.4448	0.0122
203	4.4570	0.0122

204	4.4691	0.0121
205	4.4812	0.0121
206	4.4933	0.0121
207	4.5054	0.0121
208	4.5175	0.0120
209	4.5295	0.0120
210	4.5415	0.0120
211	4.5534	0.0120
212	4.5654	0.0119
213	4.5773	0.0119
214	4.5892	0.0119
215	4.6011	0.0119
216	4.6129	0.0118
217	4.6247	0.0118
218	4.6365	0.0118
219	4.6483	0.0118
220	4.6600	0.0117
221	4.6718	0.0117
222	4.6835	0.0117
223	4.6951	0.0117
224	4.7068	0.0117
225	4.7184	0.0116
226	4.7300	0.0116
227	4.7416	0.0116
228	4.7532	0.0116
229	4.7647	0.0115
230	4.7762	0.0115
231	4.7877	0.0115
232	4.7992	0.0115
233	4.8106	0.0114
234	4.8221	0.0114
235	4.8335	0.0114
236	4.8448	0.0114
237	4.8562	0.0114
238	4.8675	0.0113
239	4.8789	0.0113
240	4.8902	0.0113
241	4.9014	0.0113
242	4.9127	0.0113
243	4.9239	0.0112
244	4.9352	0.0112
245	4.9463	0.0112
246	4.9575	0.0112
247	4.9687	0.0112
248	4.9798	0.0111
249	4.9909	0.0111
250	5.0020	0.0111
251	5.0131	0.0111
252	5.0241	0.0111
253	5.0352	0.0110
254	5.0462	0.0110
255	5.0572	0.0110
256	5.0682	0.0110
257	5.0791	0.0110
258	5.0901	0.0109
259	5.1010	0.0109
260	5.1119	0.0109
261	5.1228	0.0109
262	5.1336	0.0109
263	5.1445	0.0108

264	5.1553	0.0108
265	5.1661	0.0108
266	5.1769	0.0108
267	5.1877	0.0108
268	5.1984	0.0108
269	5.2092	0.0107
270	5.2199	0.0107
271	5.2306	0.0107
272	5.2413	0.0107
273	5.2519	0.0107
274	5.2626	0.0106
275	5.2732	0.0106
276	5.2838	0.0106
277	5.2944	0.0106
278	5.3050	0.0106
279	5.3156	0.0106
280	5.3261	0.0105
281	5.3367	0.0105
282	5.3472	0.0105
283	5.3577	0.0105
284	5.3681	0.0105
285	5.3786	0.0105
286	5.3891	0.0104
287	5.3995	0.0104
288	5.4099	0.0104

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0104	0.0053	0.0051
2	0.0104	0.0053	0.0051
3	0.0105	0.0053	0.0052
4	0.0105	0.0053	0.0052
5	0.0105	0.0053	0.0052
6	0.0105	0.0053	0.0052
7	0.0106	0.0054	0.0052
8	0.0106	0.0054	0.0052
9	0.0106	0.0054	0.0052
10	0.0106	0.0054	0.0052
11	0.0107	0.0054	0.0053
12	0.0107	0.0054	0.0053
13	0.0107	0.0054	0.0053
14	0.0107	0.0054	0.0053
15	0.0108	0.0055	0.0053
16	0.0108	0.0055	0.0053
17	0.0108	0.0055	0.0053
18	0.0108	0.0055	0.0053
19	0.0109	0.0055	0.0054
20	0.0109	0.0055	0.0054
21	0.0109	0.0056	0.0054
22	0.0110	0.0056	0.0054
23	0.0110	0.0056	0.0054
24	0.0110	0.0056	0.0054
25	0.0111	0.0056	0.0054
26	0.0111	0.0056	0.0055
27	0.0111	0.0056	0.0055
28	0.0111	0.0057	0.0055

29	0.0112	0.0057	0.0055
30	0.0112	0.0057	0.0055
31	0.0112	0.0057	0.0055
32	0.0113	0.0057	0.0055
33	0.0113	0.0057	0.0056
34	0.0113	0.0057	0.0056
35	0.0114	0.0058	0.0056
36	0.0114	0.0058	0.0056
37	0.0114	0.0058	0.0056
38	0.0114	0.0058	0.0056
39	0.0115	0.0058	0.0057
40	0.0115	0.0058	0.0057
41	0.0116	0.0059	0.0057
42	0.0116	0.0059	0.0057
43	0.0116	0.0059	0.0057
44	0.0117	0.0059	0.0057
45	0.0117	0.0059	0.0058
46	0.0117	0.0059	0.0058
47	0.0118	0.0060	0.0058
48	0.0118	0.0060	0.0058
49	0.0118	0.0060	0.0058
50	0.0119	0.0060	0.0058
51	0.0119	0.0060	0.0059
52	0.0119	0.0061	0.0059
53	0.0120	0.0061	0.0059
54	0.0120	0.0061	0.0059
55	0.0121	0.0061	0.0059
56	0.0121	0.0061	0.0060
57	0.0121	0.0062	0.0060
58	0.0122	0.0062	0.0060
59	0.0122	0.0062	0.0060
60	0.0123	0.0062	0.0060
61	0.0123	0.0062	0.0061
62	0.0123	0.0063	0.0061
63	0.0124	0.0063	0.0061
64	0.0124	0.0063	0.0061
65	0.0125	0.0063	0.0061
66	0.0125	0.0063	0.0062
67	0.0126	0.0064	0.0062
68	0.0126	0.0064	0.0062
69	0.0127	0.0064	0.0062
70	0.0127	0.0064	0.0063
71	0.0128	0.0065	0.0063
72	0.0128	0.0065	0.0063
73	0.0128	0.0065	0.0063
74	0.0129	0.0065	0.0063
75	0.0129	0.0066	0.0064
76	0.0130	0.0066	0.0064
77	0.0130	0.0066	0.0064
78	0.0131	0.0066	0.0064
79	0.0131	0.0067	0.0065
80	0.0132	0.0067	0.0065
81	0.0133	0.0067	0.0065
82	0.0133	0.0067	0.0065
83	0.0134	0.0068	0.0066
84	0.0134	0.0068	0.0066
85	0.0135	0.0068	0.0066
86	0.0135	0.0069	0.0067
87	0.0136	0.0069	0.0067
88	0.0136	0.0069	0.0067

89	0.0137	0.0070	0.0067
90	0.0137	0.0070	0.0068
91	0.0138	0.0070	0.0068
92	0.0139	0.0070	0.0068
93	0.0139	0.0071	0.0069
94	0.0140	0.0071	0.0069
95	0.0141	0.0071	0.0069
96	0.0141	0.0072	0.0070
97	0.0142	0.0072	0.0070
98	0.0142	0.0072	0.0070
99	0.0143	0.0073	0.0071
100	0.0144	0.0073	0.0071
101	0.0145	0.0073	0.0071
102	0.0145	0.0074	0.0072
103	0.0146	0.0074	0.0072
104	0.0147	0.0074	0.0072
105	0.0148	0.0075	0.0073
106	0.0148	0.0075	0.0073
107	0.0149	0.0076	0.0073
108	0.0150	0.0076	0.0074
109	0.0151	0.0076	0.0074
110	0.0151	0.0077	0.0075
111	0.0152	0.0077	0.0075
112	0.0153	0.0078	0.0075
113	0.0154	0.0078	0.0076
114	0.0155	0.0078	0.0076
115	0.0156	0.0079	0.0077
116	0.0156	0.0079	0.0077
117	0.0158	0.0080	0.0078
118	0.0158	0.0080	0.0078
119	0.0160	0.0081	0.0079
120	0.0160	0.0081	0.0079
121	0.0162	0.0082	0.0080
122	0.0162	0.0082	0.0080
123	0.0164	0.0083	0.0081
124	0.0164	0.0083	0.0081
125	0.0166	0.0084	0.0082
126	0.0166	0.0084	0.0082
127	0.0168	0.0085	0.0083
128	0.0169	0.0086	0.0083
129	0.0170	0.0086	0.0084
130	0.0171	0.0087	0.0084
131	0.0173	0.0088	0.0085
132	0.0174	0.0088	0.0085
133	0.0175	0.0089	0.0086
134	0.0176	0.0089	0.0087
135	0.0178	0.0090	0.0088
136	0.0179	0.0091	0.0088
137	0.0181	0.0092	0.0089
138	0.0182	0.0092	0.0090
139	0.0184	0.0093	0.0091
140	0.0185	0.0094	0.0091
141	0.0187	0.0095	0.0092
142	0.0188	0.0095	0.0093
143	0.0190	0.0097	0.0094
144	0.0191	0.0097	0.0094
145	0.0152	0.0077	0.0075
146	0.0154	0.0078	0.0076
147	0.0156	0.0079	0.0077
148	0.0158	0.0080	0.0078

149	0.0160	0.0081	0.0079
150	0.0162	0.0082	0.0080
151	0.0165	0.0083	0.0081
152	0.0166	0.0084	0.0082
153	0.0169	0.0086	0.0083
154	0.0171	0.0087	0.0084
155	0.0174	0.0088	0.0086
156	0.0176	0.0089	0.0087
157	0.0180	0.0091	0.0088
158	0.0182	0.0092	0.0089
159	0.0186	0.0094	0.0091
160	0.0188	0.0095	0.0092
161	0.0192	0.0097	0.0095
162	0.0194	0.0099	0.0096
163	0.0199	0.0101	0.0098
164	0.0202	0.0102	0.0099
165	0.0207	0.0105	0.0102
166	0.0210	0.0107	0.0104
167	0.0216	0.0110	0.0107
168	0.0219	0.0111	0.0108
169	0.0227	0.0115	0.0112
170	0.0230	0.0117	0.0113
171	0.0238	0.0121	0.0117
172	0.0242	0.0123	0.0119
173	0.0252	0.0128	0.0124
174	0.0256	0.0130	0.0126
175	0.0267	0.0136	0.0132
176	0.0273	0.0139	0.0135
177	0.0286	0.0145	0.0141
178	0.0293	0.0149	0.0144
179	0.0309	0.0157	0.0152
180	0.0318	0.0161	0.0156
181	0.0338	0.0171	0.0166
182	0.0349	0.0177	0.0172
183	0.0375	0.0191	0.0185
184	0.0391	0.0198	0.0193
185	0.0296	0.0150	0.0146
186	0.0316	0.0160	0.0155
187	0.0366	0.0186	0.0180
188	0.0400	0.0203	0.0197
189	0.0497	0.0252	0.0245
190	0.0572	0.0290	0.0282
191	0.0868	0.0393	0.0476
192	0.1260	0.0393	0.0868
193	0.5453	0.0393	0.5061
194	0.0683	0.0347	0.0337
195	0.0442	0.0224	0.0218
196	0.0339	0.0172	0.0167
197	0.0408	0.0207	0.0201
198	0.0362	0.0184	0.0178
199	0.0327	0.0166	0.0161
200	0.0301	0.0153	0.0148
201	0.0279	0.0142	0.0138
202	0.0262	0.0133	0.0129
203	0.0247	0.0125	0.0122
204	0.0234	0.0119	0.0115
205	0.0223	0.0113	0.0110
206	0.0213	0.0108	0.0105
207	0.0204	0.0104	0.0101
208	0.0197	0.0100	0.0097

209	0.0190	0.0096	0.0093
210	0.0183	0.0093	0.0090
211	0.0178	0.0090	0.0088
212	0.0172	0.0087	0.0085
213	0.0168	0.0085	0.0083
214	0.0163	0.0083	0.0080
215	0.0159	0.0081	0.0078
216	0.0155	0.0079	0.0076
217	0.0193	0.0098	0.0095
218	0.0189	0.0096	0.0093
219	0.0186	0.0094	0.0092
220	0.0183	0.0093	0.0090
221	0.0180	0.0091	0.0089
222	0.0177	0.0090	0.0087
223	0.0174	0.0088	0.0086
224	0.0172	0.0087	0.0085
225	0.0169	0.0086	0.0083
226	0.0167	0.0085	0.0082
227	0.0165	0.0084	0.0081
228	0.0163	0.0083	0.0080
229	0.0161	0.0082	0.0079
230	0.0159	0.0081	0.0078
231	0.0157	0.0080	0.0077
232	0.0155	0.0079	0.0076
233	0.0153	0.0078	0.0076
234	0.0152	0.0077	0.0075
235	0.0150	0.0076	0.0074
236	0.0149	0.0075	0.0073
237	0.0147	0.0075	0.0072
238	0.0146	0.0074	0.0072
239	0.0144	0.0073	0.0071
240	0.0143	0.0073	0.0070
241	0.0142	0.0072	0.0070
242	0.0140	0.0071	0.0069
243	0.0139	0.0071	0.0068
244	0.0138	0.0070	0.0068
245	0.0137	0.0069	0.0067
246	0.0135	0.0069	0.0067
247	0.0134	0.0068	0.0066
248	0.0133	0.0068	0.0066
249	0.0132	0.0067	0.0065
250	0.0131	0.0067	0.0065
251	0.0130	0.0066	0.0064
252	0.0129	0.0066	0.0064
253	0.0128	0.0065	0.0063
254	0.0127	0.0065	0.0063
255	0.0126	0.0064	0.0062
256	0.0125	0.0064	0.0062
257	0.0125	0.0063	0.0061
258	0.0124	0.0063	0.0061
259	0.0123	0.0062	0.0061
260	0.0122	0.0062	0.0060
261	0.0121	0.0062	0.0060
262	0.0120	0.0061	0.0059
263	0.0120	0.0061	0.0059
264	0.0119	0.0060	0.0059
265	0.0118	0.0060	0.0058
266	0.0117	0.0060	0.0058
267	0.0117	0.0059	0.0058
268	0.0116	0.0059	0.0057

```
      269              0.0115           0.0059              0.0057
      270              0.0115           0.0058              0.0056
      271              0.0114           0.0058              0.0056
      272              0.0113           0.0058              0.0056
      273              0.0113           0.0057              0.0056
      274              0.0112           0.0057              0.0055
      275              0.0112           0.0057              0.0055
      276              0.0111           0.0056              0.0055
      277              0.0110           0.0056              0.0054
      278              0.0110           0.0056              0.0054
      279              0.0109           0.0055              0.0054
      280              0.0109           0.0055              0.0054
      281              0.0108           0.0055              0.0053
      282              0.0108           0.0055              0.0053
      283              0.0107           0.0054              0.0053
      284              0.0106           0.0054              0.0052
      285              0.0106           0.0054              0.0052
      286              0.0105           0.0054              0.0052
      287              0.0105           0.0053              0.0052
      288              0.0104           0.0053              0.0051
      ------------------------------------------------------------------
--
      ------------------------------------------------------------------
--
      Total soil rain loss =      2.48(In)
      Total effective rainfall =      2.93(In)
      Peak flow rate in flood hydrograph =     24.28(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       0.0001      0.01  Q         |         |         |
|
    0+10       0.0005      0.06  Q         |         |         |
|
    0+15       0.0016      0.17  Q         |         |         |
|
    0+20       0.0041      0.36  Q         |         |         |
|
    0+25       0.0076      0.50  Q         |         |         |
|
    0+30       0.0116      0.58  Q         |         |         |
|
    0+35       0.0160      0.64  Q         |         |         |
|
    0+40       0.0207      0.69  Q         |         |         |
|
    0+45       0.0257      0.72  Q         |         |         |
```

```
|
   0+50       0.0309      0.75  VQ        |         |         |
|
   0+55       0.0362      0.78  VQ        |         |         |
|
   1+ 0       0.0418      0.80  VQ        |         |         |
|
   1+ 5       0.0474      0.82  VQ        |         |         |
|
   1+10       0.0531      0.83  VQ        |         |         |
|
   1+15       0.0590      0.85  VQ        |         |         |
|
   1+20       0.0649      0.86  VQ        |         |         |
|
   1+25       0.0709      0.87  VQ        |         |         |
|
   1+30       0.0769      0.88  VQ        |         |         |
|
   1+35       0.0831      0.89  VQ        |         |         |
|
   1+40       0.0893      0.90  |Q        |         |         |
|
   1+45       0.0955      0.91  |Q        |         |         |
|
   1+50       0.1018      0.91  |Q        |         |         |
|
   1+55       0.1081      0.92  |Q        |         |         |
|
   2+ 0       0.1145      0.92  |Q        |         |         |
|
   2+ 5       0.1209      0.93  |Q        |         |         |
|
   2+10       0.1273      0.93  |Q        |         |         |
|
   2+15       0.1337      0.94  |Q        |         |         |
|
   2+20       0.1402      0.94  |Q        |         |         |
|
   2+25       0.1468      0.95  |Q        |         |         |
|
   2+30       0.1533      0.95  |Q        |         |         |
|
   2+35       0.1599      0.96  |Q        |         |         |
|
   2+40       0.1665      0.96  |Q        |         |         |
|
   2+45       0.1731      0.96  |Q        |         |         |
|
   2+50       0.1798      0.96  |QV       |         |         |
|
   2+55       0.1864      0.97  |QV       |         |         |
|
   3+ 0       0.1931      0.97  |QV       |         |         |
|
   3+ 5       0.1998      0.97  |QV       |         |         |
|
   3+10       0.2065      0.98  |QV       |         |         |
|
   3+15       0.2133      0.98  |QV       |         |         |
```

```
|
   3+20       0.2200      0.98  |QV       |         |         |
|
   3+25       0.2268      0.98  |QV       |         |         |
|
   3+30       0.2336      0.99  |QV       |         |         |
|
   3+35       0.2404      0.99  |QV       |         |         |
|
   3+40       0.2472      0.99  |QV       |         |         |
|
   3+45       0.2541      0.99  |QV       |         |         |
|
   3+50       0.2609      1.00  |QV       |         |         |
|
   3+55       0.2678      1.00  |Q V      |         |         |
|
   4+ 0       0.2747      1.00  |Q V      |         |         |
|
   4+ 5       0.2817      1.01  |Q V      |         |         |
|
   4+10       0.2886      1.01  |Q V      |         |         |
|
   4+15       0.2956      1.01  |Q V      |         |         |
|
   4+20       0.3026      1.02  |Q V      |         |         |
|
   4+25       0.3096      1.02  |Q V      |         |         |
|
   4+30       0.3167      1.02  |Q V      |         |         |
|
   4+35       0.3237      1.02  |Q V      |         |         |
|
   4+40       0.3308      1.03  |Q V      |         |         |
|
   4+45       0.3379      1.03  |Q V      |         |         |
|
   4+50       0.3450      1.03  |Q V      |         |         |
|
   4+55       0.3522      1.04  |Q V      |         |         |
|
   5+ 0       0.3593      1.04  |Q  V     |         |         |
|
   5+ 5       0.3665      1.04  |Q  V     |         |         |
|
   5+10       0.3738      1.05  |Q  V     |         |         |
|
   5+15       0.3810      1.05  |Q  V     |         |         |
|
   5+20       0.3883      1.06  |Q  V     |         |         |
|
   5+25       0.3956      1.06  |Q  V     |         |         |
|
   5+30       0.4029      1.06  |Q  V     |         |         |
|
   5+35       0.4102      1.07  |Q  V     |         |         |
|
   5+40       0.4176      1.07  |Q  V     |         |         |
|
   5+45       0.4250      1.07  |Q  V     |         |         |
```

```
|
   5+50       0.4324      1.08  |Q  V     |         |         |
|
   5+55       0.4398      1.08  |Q  V     |         |         |
|
   6+ 0       0.4473      1.08  |Q   V    |         |         |
|
   6+ 5       0.4548      1.09  |Q   V    |         |         |
|
   6+10       0.4623      1.09  |Q   V    |         |         |
|
   6+15       0.4698      1.10  |Q   V    |         |         |
|
   6+20       0.4774      1.10  |Q   V    |         |         |
|
   6+25       0.4850      1.10  |Q   V    |         |         |
|
   6+30       0.4927      1.11  |Q   V    |         |         |
|
   6+35       0.5003      1.11  |Q   V    |         |         |
|
   6+40       0.5080      1.12  |Q   V    |         |         |
|
   6+45       0.5157      1.12  |Q   V    |         |         |
|
   6+50       0.5235      1.12  |Q   V    |         |         |
|
   6+55       0.5312      1.13  |Q   V    |         |         |
|
   7+ 0       0.5391      1.13  |Q    V   |         |         |
|
   7+ 5       0.5469      1.14  |Q    V   |         |         |
|
   7+10       0.5548      1.14  |Q    V   |         |         |
|
   7+15       0.5627      1.15  |Q    V   |         |         |
|
   7+20       0.5706      1.15  |Q    V   |         |         |
|
   7+25       0.5786      1.16  |Q    V   |         |         |
|
   7+30       0.5865      1.16  |Q    V   |         |         |
|
   7+35       0.5946      1.17  |Q    V   |         |         |
|
   7+40       0.6026      1.17  |Q    V   |         |         |
|
   7+45       0.6107      1.18  |Q    V   |         |         |
|
   7+50       0.6189      1.18  |Q    V   |         |         |
|
   7+55       0.6270      1.19  |Q     V  |         |         |
|
   8+ 0       0.6352      1.19  |Q     V  |         |         |
|
   8+ 5       0.6435      1.20  |Q     V  |         |         |
|
   8+10       0.6517      1.20  |Q     V  |         |         |
|
   8+15       0.6601      1.21  |Q     V  |         |         |
```

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|
   8+20       0.6684      1.21  |Q     V  |         |         |
|
   8+25       0.6768      1.22  |Q     V  |         |         |
|
   8+30       0.6852      1.22  |Q     V  |         |         |
|
   8+35       0.6937      1.23  |Q     V  |         |         |
|
   8+40       0.7022      1.23  |Q     V  |         |         |
|
   8+45       0.7107      1.24  |Q      V |         |         |
|
   8+50       0.7193      1.25  |Q      V |         |         |
|
   8+55       0.7279      1.25  |Q      V |         |         |
|
   9+ 0       0.7366      1.26  |Q      V |         |         |
|
   9+ 5       0.7453      1.27  |Q      V |         |         |
|
   9+10       0.7541      1.27  |Q      V |         |         |
|
   9+15       0.7629      1.28  |Q      V |         |         |
|
   9+20       0.7717      1.28  |Q      V |         |         |
|
   9+25       0.7806      1.29  |Q      V |         |         |
|
   9+30       0.7896      1.30  |Q      V |         |         |
|
   9+35       0.7986      1.30  |Q       V|         |         |
|
   9+40       0.8076      1.31  |Q       V|         |         |
|
   9+45       0.8167      1.32  |Q       V|         |         |
|
   9+50       0.8258      1.33  |Q       V|         |         |
|
   9+55       0.8350      1.33  |Q       V|         |         |
|
  10+ 0       0.8442      1.34  |Q       V|         |         |
|
  10+ 5       0.8535      1.35  |Q       V|         |         |
|
  10+10       0.8629      1.36  |Q       V|         |         |
|
  10+15       0.8723      1.36  |Q       V|         |         |
|
  10+20       0.8817      1.37  |Q       V|         |         |
|
  10+25       0.8912      1.38  |Q        V         |         |
|
  10+30       0.9008      1.39  |Q        V         |         |
|
  10+35       0.9104      1.40  |Q        V         |         |
|
  10+40       0.9201      1.41  |Q        V         |         |
|
  10+45       0.9299      1.42  |Q        V         |         |
```

```
|
  10+50       0.9397      1.43  |Q        V         |         |
|
  10+55       0.9496      1.43  |Q        V         |         |
|
  11+ 0       0.9595      1.44  |Q        V         |         |
|
  11+ 5       0.9696      1.45  |Q        V         |         |
|
  11+10       0.9796      1.46  |Q        |V        |         |
|
  11+15       0.9898      1.47  |Q        |V        |         |
|
  11+20       1.0000      1.49  |Q        |V        |         |
|
  11+25       1.0103      1.50  |Q        |V        |         |
|
  11+30       1.0207      1.51  | Q       |V        |         |
|
  11+35       1.0312      1.52  | Q       |V        |         |
|
  11+40       1.0417      1.53  | Q       |V        |         |
|
  11+45       1.0523      1.54  | Q       |V        |         |
|
  11+50       1.0630      1.55  | Q       |V        |         |
|
  11+55       1.0738      1.57  | Q       | V       |         |
|
  12+ 0       1.0847      1.58  | Q       | V       |         |
|
  12+ 5       1.0956      1.59  | Q       | V       |         |
|
  12+10       1.1065      1.58  | Q       | V       |         |
|
  12+15       1.1172      1.55  | Q       | V       |         |
|
  12+20       1.1275      1.49  |Q        | V       |         |
|
  12+25       1.1375      1.45  |Q        | V       |         |
|
  12+30       1.1474      1.43  |Q        | V       |         |
|
  12+35       1.1572      1.43  |Q        |  V      |         |
|
  12+40       1.1670      1.43  |Q        |  V      |         |
|
  12+45       1.1769      1.43  |Q        |  V      |         |
|
  12+50       1.1867      1.44  |Q        |  V      |         |
|
  12+55       1.1967      1.44  |Q        |  V      |         |
|
  13+ 0       1.2067      1.45  |Q        |  V      |         |
|
  13+ 5       1.2168      1.47  |Q        |  V      |         |
|
  13+10       1.2270      1.48  |Q        |  V      |         |
|
  13+15       1.2373      1.50  |Q        |  V      |         |
```

13+20	1.2478	1.52	Q	V	
13+25	1.2583	1.53	Q	V	
13+30	1.2691	1.56	Q	V	
13+35	1.2799	1.58	Q	V	
13+40	1.2909	1.60	Q	V	
13+45	1.3021	1.63	Q	V	
13+50	1.3135	1.65	Q	V	
13+55	1.3251	1.68	Q	V	
14+ 0	1.3369	1.71	Q	V	
14+ 5	1.3489	1.74	Q	V	
14+10	1.3611	1.78	Q	V	
14+15	1.3736	1.81	Q	V	
14+20	1.3864	1.85	Q	V	
14+25	1.3994	1.89	Q	V	
14+30	1.4128	1.94	Q	V	
14+35	1.4264	1.98	Q	V	
14+40	1.4405	2.04	Q	V	
14+45	1.4549	2.09	Q	V	
14+50	1.4697	2.15	Q	V	
14+55	1.4849	2.22	Q	V	
15+ 0	1.5007	2.29	Q	V	
15+ 5	1.5170	2.36	Q	V	
15+10	1.5339	2.45	Q	V	
15+15	1.5514	2.55	Q	V	
15+20	1.5697	2.65	Q	V	
15+25	1.5887	2.76	Q	V	
15+30	1.6083	2.84	Q	V	
15+35	1.6280	2.86	Q	V	
15+40	1.6473	2.81	Q	V	
15+45	1.6669	2.85	Q	V	

```
|
  15+50       1.6877      3.02  |   Q     |        V|         |
|
  15+55       1.7107      3.33  |   Q     |        V|         |
|
  16+ 0       1.7378      3.93  |    Q    |        V|         |
|
  16+ 5       1.7790      5.99  |      Q  |         V         |
|
  16+10       1.8508     10.42  |         |  Q      V         |
|
  16+15       1.9707     17.42  |         |         | VQ      |
|
  16+20       2.1379     24.28  |         |         |   V     | Q
|
  16+25       2.2637     18.25  |         |         |   QV    |
|
  16+30       2.3511     12.69  |         |     Q   |     V   |
|
  16+35       2.4188      9.84  |         |  Q      |      V  |
|
  16+40       2.4757      8.26  |         |Q        |      V  |
|
  16+45       2.5249      7.13  |        Q|         |       V |
|
  16+50       2.5676      6.20  |       Q |         |       V |
|
  16+55       2.6058      5.55  |      Q  |         |        V|
|
  17+ 0       2.6406      5.05  |     Q   |         |        V|
|
  17+ 5       2.6716      4.51  |     Q   |         |         V
|
  17+10       2.6993      4.03  |    Q    |         |         V
|
  17+15       2.7252      3.76  |    Q    |         |         V
|
  17+20       2.7493      3.49  |   Q     |         |         V
|
  17+25       2.7716      3.24  |   Q     |         |         |V
|
  17+30       2.7921      2.98  |  Q      |         |         |V
|
  17+35       2.8116      2.83  |  Q      |         |         |V
|
  17+40       2.8296      2.61  |  Q      |         |         |V
|
  17+45       2.8466      2.47  |  Q      |         |         | V
|
  17+50       2.8622      2.27  |  Q      |         |         | V
|
  17+55       2.8770      2.14  | Q       |         |         | V
|
  18+ 0       2.8905      1.96  | Q       |         |         | V
|
  18+ 5       2.9036      1.90  | Q       |         |         | V
|
  18+10       2.9167      1.90  | Q       |         |         | V
|
  18+15       2.9298      1.90  | Q       |         |         |  V
```

```
|
  18+20       2.9430      1.93  | Q       |         |         |  V
|
  18+25       2.9562      1.91  | Q       |         |         |  V
|
  18+30       2.9686      1.81  | Q       |         |         |  V
|
  18+35       2.9807      1.76  | Q       |         |         |  V
|
  18+40       2.9922      1.67  | Q       |         |         |  V
|
  18+45       3.0031      1.58  | Q       |         |         |  V
|
  18+50       3.0138      1.56  | Q       |         |         |  V
|
  18+55       3.0244      1.54  | Q       |         |         |   V
|
  19+ 0       3.0349      1.52  | Q       |         |         |   V
|
  19+ 5       3.0452      1.50  |Q        |         |         |   V
|
  19+10       3.0553      1.48  |Q        |         |         |   V
|
  19+15       3.0654      1.46  |Q        |         |         |   V
|
  19+20       3.0753      1.44  |Q        |         |         |   V
|
  19+25       3.0851      1.42  |Q        |         |         |   V
|
  19+30       3.0948      1.41  |Q        |         |         |   V
|
  19+35       3.1044      1.39  |Q        |         |         |   V
|
  19+40       3.1139      1.38  |Q        |         |         |    V
|
  19+45       3.1232      1.36  |Q        |         |         |    V
|
  19+50       3.1325      1.35  |Q        |         |         |    V
|
  19+55       3.1417      1.33  |Q        |         |         |    V
|
  20+ 0       3.1508      1.32  |Q        |         |         |    V
|
  20+ 5       3.1597      1.30  |Q        |         |         |    V
|
  20+10       3.1686      1.29  |Q        |         |         |    V
|
  20+15       3.1774      1.28  |Q        |         |         |    V
|
  20+20       3.1861      1.27  |Q        |         |         |    V
|
  20+25       3.1948      1.25  |Q        |         |         |     V
|
  20+30       3.2033      1.24  |Q        |         |         |     V
|
  20+35       3.2118      1.23  |Q        |         |         |     V
|
  20+40       3.2202      1.22  |Q        |         |         |     V
|
  20+45       3.2285      1.21  |Q        |         |         |     V
```

```
|
  20+50       3.2368      1.20  |Q        |         |         |     V
|
  20+55       3.2450      1.19  |Q        |         |         |     V
|
  21+ 0       3.2531      1.18  |Q        |         |         |     V
|
  21+ 5       3.2611      1.17  |Q        |         |         |     V
|
  21+10       3.2691      1.16  |Q        |         |         |     V
|
  21+15       3.2770      1.15  |Q        |         |         |     V
|
  21+20       3.2848      1.14  |Q        |         |         |      V
|
  21+25       3.2926      1.13  |Q        |         |         |      V
|
  21+30       3.3003      1.12  |Q        |         |         |      V
|
  21+35       3.3080      1.11  |Q        |         |         |      V
|
  21+40       3.3156      1.10  |Q        |         |         |      V
|
  21+45       3.3231      1.10  |Q        |         |         |      V
|
  21+50       3.3306      1.09  |Q        |         |         |      V
|
  21+55       3.3381      1.08  |Q        |         |         |      V
|
  22+ 0       3.3455      1.07  |Q        |         |         |      V
|
  22+ 5       3.3528      1.07  |Q        |         |         |      V
|
  22+10       3.3601      1.06  |Q        |         |         |      V
|
  22+15       3.3674      1.05  |Q        |         |         |      V
|
  22+20       3.3746      1.04  |Q        |         |         |       V
|
  22+25       3.3817      1.04  |Q        |         |         |       V
|
  22+30       3.3888      1.03  |Q        |         |         |       V
|
  22+35       3.3959      1.03  |Q        |         |         |       V
|
  22+40       3.4029      1.02  |Q        |         |         |       V
|
  22+45       3.4099      1.01  |Q        |         |         |       V
|
  22+50       3.4168      1.01  |Q        |         |         |       V
|
  22+55       3.4237      1.00  |Q        |         |         |       V
|
  23+ 0       3.4305      0.99  |Q        |         |         |       V
|
  23+ 5       3.4373      0.99  |Q        |         |         |       V
|
  23+10       3.4441      0.98  |Q        |         |         |       V
|
  23+15       3.4508      0.98  |Q        |         |         |       V
```

```
|
   23+20       3.4575      0.97  |Q        |         |         |       V
|
   23+25       3.4642      0.97  |Q        |         |         |
V|
   23+30       3.4708      0.96  |Q        |         |         |
V|
   23+35       3.4774      0.96  |Q        |         |         |
V|
   23+40       3.4840      0.95  |Q        |         |         |
V|
   23+45       3.4905      0.95  |Q        |         |         |
V|
   23+50       3.4970      0.94  |Q        |         |         |
V|
   23+55       3.5034      0.94  |Q        |         |         |
V|
   24+ 0       3.5098      0.93  |Q        |         |         |
V|
   24+ 5       3.5162      0.92  |Q        |         |         |
V|
   24+10       3.5221      0.87  |Q        |         |         |
V|
   24+15       3.5273      0.75  |Q        |         |         |
V|
   24+20       3.5311      0.55  Q         |         |         |
V|
   24+25       3.5340      0.42  Q         |         |         |
V|
   24+30       3.5362      0.33  Q         |         |         |
V|
   24+35       3.5381      0.27  Q         |         |         |
V|
   24+40       3.5397      0.23  Q         |         |         |
V|
   24+45       3.5410      0.19  Q         |         |         |
V|
   24+50       3.5421      0.16  Q         |         |         |
V|
   24+55       3.5431      0.14  Q         |         |         |
V|
   25+ 0       3.5439      0.12  Q         |         |         |
V|
   25+ 5       3.5446      0.10  Q         |         |         |
V|
   25+10       3.5452      0.09  Q         |         |         |
V|
   25+15       3.5457      0.07  Q         |         |         |
V|
   25+20       3.5461      0.06  Q         |         |         |
V|
   25+25       3.5465      0.05  Q         |         |         |
V|
   25+30       3.5468      0.05  Q         |         |         |
V|
   25+35       3.5471      0.04  Q         |         |         |
V|
   25+40       3.5473      0.03  Q         |         |         |
V|
   25+45       3.5475      0.03  Q         |         |         |
```

```
V|
   25+50       3.5476      0.02  Q         |         |         |
V|
   25+55       3.5478      0.02  Q         |         |         |
V|
   26+ 0       3.5479      0.02  Q         |         |         |
V|
   26+ 5       3.5480      0.01  Q         |         |         |
V|
   26+10       3.5481      0.01  Q         |         |         |
V|
   26+15       3.5481      0.01  Q         |         |         |
V|
   26+20       3.5482      0.01  Q         |         |         |
V|
   26+25       3.5482      0.00  Q         |         |         |
V|
   26+30       3.5482      0.00  Q         |         |         |
V|
   26+35       3.5482      0.00  Q         |         |         |
V
-----------------------------------------------------------------------
```

```
                         FLOOD HYDROGRAPH ROUTING PROGRAM
                  Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012
                              Study date: 07/08/22

      ---------------------------------------------------------------
---


      Olivera & Pena
      100 yr 24hr
      Basin Routing
      Run 3
      ---------------------------------------------------------------
--


      Program License Serial Number 6232

      ---------------------------------------------------------------
--
      ********************* HYDROGRAPH INFORMATION
**********************

                  From study/file name: oliverapro.rte
      ****************************HYDROGRAPH
DATA****************************
                  Number of intervals =   319
                  Time interval =    5.0 (Min.)
                  Maximum/Peak flow rate =       24.278 (CFS)
                  Total volume =       3.548 (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      103.000 to Point/Station
104.000
      **** RETARDING BASIN ROUTING ****
      ________________________________________________________________
____

      User entry of depth-outflow-storage data
      ---------------------------------------------------------------
--
      Total number of inflow hydrograph intervals = 319
      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  Storage    Outflow   (S-O*dt/2)   (S+O*dt/2)
           (Ft.)    (Ac.Ft)    (CFS)     (Ac.Ft)    (Ac.Ft)
      ------------------------------------------------------------------
---
          0.000      0.000      0.000      0.000        0.000
          1.000      0.253      0.720      0.251        0.255
          2.000      0.536      0.720      0.534        0.538
          3.000      0.850      0.720      0.848        0.852
          4.000      1.200     13.725      1.153        1.247
      ------------------------------------------------------------------
--
                  Hydrograph Detention Basin Routing
      ------------------------------------------------------------------
---

      Graph values: 'I'= unit inflow; 'O'=outflow at time shown
      ------------------------------------------------------------------
---
  Time   Inflow  Outflow    Storage
Depth
 (Hours)  (CFS)   (CFS)     (Ac.Ft) .0       6.1   12.14   18.21   24.28
(Ft.)
  0.083    0.01    0.00      0.000  O       |       |       |       |
0.00
  0.167    0.06    0.00      0.000  O       |       |       |       |
0.00
  0.250    0.17    0.00      0.001  O       |       |       |       |
0.00
  0.333    0.36    0.01      0.003  O       |       |       |       |
0.01
  0.417    0.50    0.02      0.006  O       |       |       |       |
0.02
  0.500    0.58    0.03      0.009  O       |       |       |       |
0.04
  0.583    0.64    0.04      0.013  O       |       |       |       |
0.05
  0.667    0.69    0.05      0.018  O       |       |       |       |
0.07
  0.750    0.72    0.06      0.022  O       |       |       |       |
0.09
  0.833    0.75    0.08      0.027  O       |       |       |       |
0.11
  0.917    0.78    0.09      0.031  OI      |       |       |       |
0.12
  1.000    0.80    0.10      0.036  OI      |       |       |       |
0.14
  1.083    0.82    0.12      0.041  OI      |       |       |       |
0.16
  1.167    0.83    0.13      0.046  OI      |       |       |       |
0.18
  1.250    0.85    0.14      0.051  OI      |       |       |       |
```

0.20
1.333 0.86 0.16 0.055 OI | | | |
0.22
1.417 0.87 0.17 0.060 OI | | | |
0.24
1.500 0.88 0.19 0.065 OI | | | |
0.26
1.583 0.89 0.20 0.070 OI | | | |
0.28
1.667 0.90 0.21 0.075 OI | | | |
0.29
1.750 0.91 0.23 0.079 OI | | | |
0.31
1.833 0.91 0.24 0.084 OI | | | |
0.33
1.917 0.92 0.25 0.089 OI | | | |
0.35
2.000 0.92 0.27 0.093 OI | | | |
0.37
2.083 0.93 0.28 0.098 OI | | | |
0.39
2.167 0.93 0.29 0.102 OI | | | |
0.40
2.250 0.94 0.30 0.106 OI | | | |
0.42
2.333 0.94 0.32 0.111 OI | | | |
0.44
2.417 0.95 0.33 0.115 OI | | | |
0.46
2.500 0.95 0.34 0.119 OI | | | |
0.47
2.583 0.96 0.35 0.124 OI | | | |
0.49
2.667 0.96 0.36 0.128 OI | | | |
0.50
2.750 0.96 0.37 0.132 OI | | | |
0.52
2.833 0.96 0.39 0.136 OI | | | |
0.54
2.917 0.97 0.40 0.140 OI | | | |
0.55
3.000 0.97 0.41 0.144 OI | | | |
0.57
3.083 0.97 0.42 0.147 OI | | | |
0.58
3.167 0.98 0.43 0.151 OI | | | |
0.60
3.250 0.98 0.44 0.155 OI | | | |
0.61
3.333 0.98 0.45 0.159 OI | | | |
0.63
3.417 0.98 0.46 0.162 OI | | | |
0.64
3.500 0.99 0.47 0.166 OI | | | |
0.66
3.583 0.99 0.48 0.169 OI | | | |
0.67
3.667 0.99 0.49 0.173 OI | | | |
0.68
3.750 0.99 0.50 0.176 OI | | | |

0.70
3.833 1.00 0.51 0.180 OI | | | |
0.71
3.917 1.00 0.52 0.183 OI | | | |
0.72
4.000 1.00 0.53 0.186 OI | | | |
0.74
4.083 1.01 0.54 0.189 OI | | | |
0.75
4.167 1.01 0.55 0.193 OI | | | |
0.76
4.250 1.01 0.56 0.196 OI | | | |
0.77
4.333 1.02 0.57 0.199 OI | | | |
0.79
4.417 1.02 0.57 0.202 OI | | | |
0.80
4.500 1.02 0.58 0.205 OI | | | |
0.81
4.583 1.02 0.59 0.208 OI | | | |
0.82
4.667 1.03 0.60 0.211 OI | | | |
0.83
4.750 1.03 0.61 0.214 OI | | | |
0.85
4.833 1.03 0.62 0.217 OI | | | |
0.86
4.917 1.04 0.63 0.220 OI | | | |
0.87
5.000 1.04 0.63 0.223 OI | | | |
0.88
5.083 1.04 0.64 0.225 OI | | | |
0.89
5.167 1.05 0.65 0.228 OI | | | |
0.90
5.250 1.05 0.66 0.231 OI | | | |
0.91
5.333 1.06 0.66 0.233 OI | | | |
0.92
5.417 1.06 0.67 0.236 OI | | | |
0.93
5.500 1.06 0.68 0.239 OI | | | |
0.94
5.583 1.07 0.69 0.241 OI | | | |
0.95
5.667 1.07 0.69 0.244 OI | | | |
0.96
5.750 1.07 0.70 0.247 OI | | | |
0.97
5.833 1.08 0.71 0.249 OI | | | |
0.98
5.917 1.08 0.72 0.252 OI | | | |
0.99
6.000 1.08 0.72 0.254 OI | | | |
1.00
6.083 1.09 0.72 0.257 OI | | | |
1.01
6.167 1.09 0.72 0.259 OI | | | |
1.02
6.250 1.10 0.72 0.262 OI | | | |

1.03								
6.333	1.10	0.72	0.264	OI				
1.04								
6.417	1.10	0.72	0.267	OI				
1.05								
6.500	1.11	0.72	0.270	OI				
1.06								
6.583	1.11	0.72	0.272	OI				
1.07								
6.667	1.12	0.72	0.275	OI				
1.08								
6.750	1.12	0.72	0.278	OI				
1.09								
6.833	1.12	0.72	0.281	OI				
1.10								
6.917	1.13	0.72	0.283	OI				
1.11								
7.000	1.13	0.72	0.286	OI				
1.12								
7.083	1.14	0.72	0.289	OI				
1.13								
7.167	1.14	0.72	0.292	OI				
1.14								
7.250	1.15	0.72	0.295	OI				
1.15								
7.333	1.15	0.72	0.298	OI				
1.16								
7.417	1.16	0.72	0.301	OI				
1.17								
7.500	1.16	0.72	0.304	OI				
1.18								
7.583	1.17	0.72	0.307	OI				
1.19								
7.667	1.17	0.72	0.310	OI				
1.20								
7.750	1.18	0.72	0.313	OI				
1.21								
7.833	1.18	0.72	0.316	OI				
1.22								
7.917	1.19	0.72	0.320	OI				
1.24								
8.000	1.19	0.72	0.323	OI				
1.25								
8.083	1.20	0.72	0.326	OI				
1.26								
8.167	1.20	0.72	0.329	OI				
1.27								
8.250	1.21	0.72	0.333	OI				
1.28								
8.333	1.21	0.72	0.336	OI				
1.29								
8.417	1.22	0.72	0.339	OI				
1.31								
8.500	1.22	0.72	0.343	OI				
1.32								
8.583	1.23	0.72	0.346	OI				
1.33								
8.667	1.23	0.72	0.350	OI				
1.34								
8.750	1.24	0.72	0.353	OI				

1.35								
8.833	1.25	0.72	0.357	OI	|	|	|	|
1.37								
8.917	1.25	0.72	0.361	OI	|	|	|	|
1.38								
9.000	1.26	0.72	0.364	OI	|	|	|	|
1.39								
9.083	1.27	0.72	0.368	OI	|	|	|	|
1.41								
9.167	1.27	0.72	0.372	OI	|	|	|	|
1.42								
9.250	1.28	0.72	0.376	OI	|	|	|	|
1.43								
9.333	1.28	0.72	0.380	OI	|	|	|	|
1.45								
9.417	1.29	0.72	0.383	OI	|	|	|	|
1.46								
9.500	1.30	0.72	0.387	OI	|	|	|	|
1.48								
9.583	1.30	0.72	0.391	OI	|	|	|	|
1.49								
9.667	1.31	0.72	0.396	OI	|	|	|	|
1.50								
9.750	1.32	0.72	0.400	OI	|	|	|	|
1.52								
9.833	1.33	0.72	0.404	OI	|	|	|	|
1.53								
9.917	1.33	0.72	0.408	OI	|	|	|	|
1.55								
10.000	1.34	0.72	0.412	OI	|	|	|	|
1.56								
10.083	1.35	0.72	0.417	OI	|	|	|	|
1.58								
10.167	1.36	0.72	0.421	OI	|	|	|	|
1.59								
10.250	1.36	0.72	0.425	OI	|	|	|	|
1.61								
10.333	1.37	0.72	0.430	OI	|	|	|	|
1.62								
10.417	1.38	0.72	0.434	OI	|	|	|	|
1.64								
10.500	1.39	0.72	0.439	OI	|	|	|	|
1.66								
10.583	1.40	0.72	0.444	OI	|	|	|	|
1.67								
10.667	1.41	0.72	0.448	OI	|	|	|	|
1.69								
10.750	1.42	0.72	0.453	OI	|	|	|	|
1.71								
10.833	1.43	0.72	0.458	OI	|	|	|	|
1.72								
10.917	1.43	0.72	0.463	OI	|	|	|	|
1.74								
11.000	1.44	0.72	0.468	OI	|	|	|	|
1.76								
11.083	1.45	0.72	0.473	OI	|	|	|	|
1.78								
11.167	1.46	0.72	0.478	OI	|	|	|	|
1.79								
11.250	1.47	0.72	0.483	OI	|	|	|	|

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1.81
 11.333    1.49    0.72      0.488  OI      |       |       |       |
1.83
 11.417    1.50    0.72      0.493  OI      |       |       |       |
1.85
 11.500    1.51    0.72      0.499  OI      |       |       |       |
1.87
 11.583    1.52    0.72      0.504  O I     |       |       |       |
1.89
 11.667    1.53    0.72      0.510  O I     |       |       |       |
1.91
 11.750    1.54    0.72      0.515  O I     |       |       |       |
1.93
 11.833    1.55    0.72      0.521  O I     |       |       |       |
1.95
 11.917    1.57    0.72      0.527  O I     |       |       |       |
1.97
 12.000    1.58    0.72      0.533  O I     |       |       |       |
1.99
 12.083    1.59    0.72      0.539  O I     |       |       |       |
2.01
 12.167    1.58    0.72      0.545  O I     |       |       |       |
2.03
 12.250    1.55    0.72      0.551  O I     |       |       |       |
2.05
 12.333    1.49    0.72      0.556  OI      |       |       |       |
2.06
 12.417    1.45    0.72      0.561  OI      |       |       |       |
2.08
 12.500    1.43    0.72      0.566  OI      |       |       |       |
2.10
 12.583    1.43    0.72      0.571  OI      |       |       |       |
2.11
 12.667    1.43    0.72      0.576  OI      |       |       |       |
2.13
 12.750    1.43    0.72      0.581  OI      |       |       |       |
2.14
 12.833    1.44    0.72      0.586  OI      |       |       |       |
2.16
 12.917    1.44    0.72      0.591  OI      |       |       |       |
2.17
 13.000    1.45    0.72      0.596  OI      |       |       |       |
2.19
 13.083    1.47    0.72      0.601  OI      |       |       |       |
2.21
 13.167    1.48    0.72      0.606  OI      |       |       |       |
2.22
 13.250    1.50    0.72      0.611  OI      |       |       |       |
2.24
 13.333    1.52    0.72      0.617  OI      |       |       |       |
2.26
 13.417    1.53    0.72      0.622  O I     |       |       |       |
2.28
 13.500    1.56    0.72      0.628  O I     |       |       |       |
2.29
 13.583    1.58    0.72      0.634  O I     |       |       |       |
2.31
 13.667    1.60    0.72      0.640  O I     |       |       |       |
2.33
 13.750    1.63    0.72      0.646  O I     |       |       |       |
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2.35
 13.833    1.65    0.72      0.652  O I     |       |       |       |
2.37
 13.917    1.68    0.72      0.659  O I     |       |       |       |
2.39
 14.000    1.71    0.72      0.666  O I     |       |       |       |
2.41
 14.083    1.74    0.72      0.673  O I     |       |       |       |
2.43
 14.167    1.78    0.72      0.680  O I     |       |       |       |
2.46
 14.250    1.81    0.72      0.687  O I     |       |       |       |
2.48
 14.333    1.85    0.72      0.695  O I     |       |       |       |
2.51
 14.417    1.89    0.72      0.703  O I     |       |       |       |
2.53
 14.500    1.94    0.72      0.711  O I     |       |       |       |
2.56
 14.583    1.98    0.72      0.719  O I     |       |       |       |
2.58
 14.667    2.04    0.72      0.728  O I     |       |       |       |
2.61
 14.750    2.09    0.72      0.738  O I     |       |       |       |
2.64
 14.833    2.15    0.72      0.747  O I     |       |       |       |
2.67
 14.917    2.22    0.72      0.757  O I     |       |       |       |
2.70
 15.000    2.29    0.72      0.768  O  I    |       |       |       |
2.74
 15.083    2.36    0.72      0.779  O  I    |       |       |       |
2.77
 15.167    2.45    0.72      0.791  O  I    |       |       |       |
2.81
 15.250    2.55    0.72      0.803  O  I    |       |       |       |
2.85
 15.333    2.65    0.72      0.816  O  I    |       |       |       |
2.89
 15.417    2.76    0.72      0.829  O  I    |       |       |       |
2.93
 15.500    2.84    0.72      0.844  O  I    |       |       |       |
2.98
 15.583    2.86    1.00      0.858  |O I    |       |       |       |
3.02
 15.667    2.81    1.42      0.869  |O I    |       |       |       |
3.05
 15.750    2.85    1.74      0.877  | OI    |       |       |       |
3.08
 15.833    3.02    2.01      0.885  | OI    |       |       |       |
3.10
 15.917    3.33    2.27      0.892  | O I   |       |       |       |
3.12
 16.000    3.93    2.58      0.900  |  O I  |       |       |       |
3.14
 16.083    5.99    3.12      0.915  |   O  I|       |       |       |
3.18
 16.167   10.42    4.28      0.946  |    O  |    I  |       |       |
3.27
 16.250   17.42    6.46      1.005  |       O       |     I |       |
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3.44
 16.333   24.28    9.73      1.092  |       |   O   |       |       I
3.69
 16.417   18.25   12.34      1.163  |       |       O       I       |
3.89
 16.500   12.69   13.05      1.182  |       |       IO      |       |
3.95
 16.583    9.84   12.65      1.171  |       |   I   O       |       |
3.92
 16.667    8.26   11.83      1.149  |       | I    O|       |       |
3.85
 16.750    7.13   10.89      1.124  |       |I    O |       |       |
3.78
 16.833    6.20    9.93      1.098  |       I    O  |       |       |
3.71
 16.917    5.55    9.01      1.073  |      I|  O    |       |       |
3.64
 17.000    5.05    8.17      1.051  |     I | O     |       |       |
3.57
 17.083    4.51    7.40      1.030  |    I  |O      |       |       |
3.51
 17.167    4.03    6.69      1.011  |    I  O       |       |       |
3.46
 17.250    3.76    6.06      0.994  |   I  O|       |       |       |
3.41
 17.333    3.49    5.50      0.979  |   I  O|       |       |       |
3.37
 17.417    3.24    5.02      0.966  |   I O |       |       |       |
3.33
 17.500    2.98    4.59      0.954  |  I  O |       |       |       |
3.30
 17.583    2.83    4.20      0.944  |  I O  |       |       |       |
3.27
 17.667    2.61    3.87      0.935  |  I O  |       |       |       |
3.24
 17.750    2.47    3.57      0.927  |  IO   |       |       |       |
3.22
 17.833    2.27    3.29      0.919  | I O   |       |       |       |
3.20
 17.917    2.14    3.05      0.913  | I O   |       |       |       |
3.18
 18.000    1.96    2.82      0.907  | IO    |       |       |       |
3.16
 18.083    1.90    2.62      0.901  | IO    |       |       |       |
3.15
 18.167    1.90    2.46      0.897  | IO    |       |       |       |
3.13
 18.250    1.90    2.33      0.893  | IO    |       |       |       |
3.12
 18.333    1.93    2.24      0.891  | O     |       |       |       |
3.12
 18.417    1.91    2.16      0.889  | O     |       |       |       |
3.11
 18.500    1.81    2.09      0.887  | O     |       |       |       |
3.11
 18.583    1.76    2.02      0.885  | O     |       |       |       |
3.10
 18.667    1.67    1.95      0.883  | O     |       |       |       |
3.09
 18.750    1.58    1.88      0.881  | O     |       |       |       |
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3.09
 18.833    1.56    1.81      0.879  | O     |        |        |        |
3.08
 18.917    1.54    1.75      0.878  | O     |        |        |        |
3.08
 19.000    1.52    1.70      0.876  |IO     |        |        |        |
3.08
 19.083    1.50    1.66      0.875  |IO     |        |        |        |
3.07
 19.167    1.48    1.62      0.874  |IO     |        |        |        |
3.07
 19.250    1.46    1.58      0.873  |IO     |        |        |        |
3.07
 19.333    1.44    1.55      0.872  |IO     |        |        |        |
3.06
 19.417    1.42    1.53      0.872  |IO     |        |        |        |
3.06
 19.500    1.41    1.50      0.871  |O      |        |        |        |
3.06
 19.583    1.39    1.48      0.870  |O      |        |        |        |
3.06
 19.667    1.38    1.46      0.870  |O      |        |        |        |
3.06
 19.750    1.36    1.44      0.869  |O      |        |        |        |
3.06
 19.833    1.35    1.42      0.869  |O      |        |        |        |
3.05
 19.917    1.33    1.40      0.868  |O      |        |        |        |
3.05
 20.000    1.32    1.38      0.868  |O      |        |        |        |
3.05
 20.083    1.30    1.37      0.867  |O      |        |        |        |
3.05
 20.167    1.29    1.35      0.867  |O      |        |        |        |
3.05
 20.250    1.28    1.34      0.867  |O      |        |        |        |
3.05
 20.333    1.27    1.32      0.866  |O      |        |        |        |
3.05
 20.417    1.25    1.31      0.866  |O      |        |        |        |
3.05
 20.500    1.24    1.29      0.865  |O      |        |        |        |
3.04
 20.583    1.23    1.28      0.865  |O      |        |        |        |
3.04
 20.667    1.22    1.27      0.865  |O      |        |        |        |
3.04
 20.750    1.21    1.26      0.864  |O      |        |        |        |
3.04
 20.833    1.20    1.24      0.864  |O      |        |        |        |
3.04
 20.917    1.19    1.23      0.864  |O      |        |        |        |
3.04
 21.000    1.18    1.22      0.863  |O      |        |        |        |
3.04
 21.083    1.17    1.21      0.863  |O      |        |        |        |
3.04
 21.167    1.16    1.20      0.863  |O      |        |        |        |
3.04
 21.250    1.15    1.19      0.863  |O      |        |        |        |
```

3.04
21.333 1.14 1.18 0.862 |O | | | |
3.04
21.417 1.13 1.17 0.862 |O | | | |
3.03
21.500 1.12 1.16 0.862 |O | | | |
3.03
21.583 1.11 1.15 0.862 |O | | | |
3.03
21.667 1.10 1.14 0.861 |O | | | |
3.03
21.750 1.10 1.13 0.861 |O | | | |
3.03
21.833 1.09 1.12 0.861 |O | | | |
3.03
21.917 1.08 1.11 0.861 |O | | | |
3.03
22.000 1.07 1.11 0.860 |O | | | |
3.03
22.083 1.07 1.10 0.860 |O | | | |
3.03
22.167 1.06 1.09 0.860 |O | | | |
3.03
22.250 1.05 1.08 0.860 |O | | | |
3.03
22.333 1.04 1.07 0.860 |O | | | |
3.03
22.417 1.04 1.07 0.859 |O | | | |
3.03
22.500 1.03 1.06 0.859 |O | | | |
3.03
22.583 1.03 1.05 0.859 |O | | | |
3.03
22.667 1.02 1.05 0.859 |O | | | |
3.03
22.750 1.01 1.04 0.859 |O | | | |
3.02
22.833 1.01 1.03 0.858 |O | | | |
3.02
22.917 1.00 1.03 0.858 |O | | | |
3.02
23.000 0.99 1.02 0.858 |O | | | |
3.02
23.083 0.99 1.01 0.858 |O | | | |
3.02
23.167 0.98 1.01 0.858 |O | | | |
3.02
23.250 0.98 1.00 0.858 |O | | | |
3.02
23.333 0.97 1.00 0.857 |O | | | |
3.02
23.417 0.97 0.99 0.857 |O | | | |
3.02
23.500 0.96 0.98 0.857 |O | | | |
3.02
23.583 0.96 0.98 0.857 |O | | | |
3.02
23.667 0.95 0.97 0.857 |O | | | |
3.02
23.750 0.95 0.97 0.857 |O | | | |

3.02
23.833 0.94 0.96 0.857 |O | | | |
3.02
23.917 0.94 0.96 0.856 |O | | | |
3.02
24.000 0.93 0.95 0.856 |O | | | |
3.02
24.083 0.92 0.95 0.856 |O | | | |
3.02
24.167 0.87 0.93 0.856 |O | | | |
3.02
24.250 0.75 0.90 0.855 IO | | | |
3.01
24.333 0.55 0.85 0.853 IO | | | |
3.01
24.417 0.42 0.77 0.851 IO | | | |
3.00
24.500 0.33 0.72 0.849 O | | | |
3.00
24.583 0.27 0.72 0.846 O | | | |
2.99
24.667 0.23 0.72 0.843 O | | | |
2.98
24.750 0.19 0.72 0.839 O | | | |
2.97
24.833 0.16 0.72 0.835 O | | | |
2.95
24.917 0.14 0.72 0.831 O | | | |
2.94
25.000 0.12 0.72 0.827 O | | | |
2.93
25.083 0.10 0.72 0.823 O | | | |
2.91
25.167 0.09 0.72 0.819 O | | | |
2.90
25.250 0.07 0.72 0.814 O | | | |
2.89
25.333 0.06 0.72 0.810 O | | | |
2.87
25.417 0.05 0.72 0.805 O | | | |
2.86
25.500 0.05 0.72 0.801 O | | | |
2.84
25.583 0.04 0.72 0.796 O | | | |
2.83
25.667 0.03 0.72 0.791 O | | | |
2.81
25.750 0.03 0.72 0.787 O | | | |
2.80
25.833 0.02 0.72 0.782 O | | | |
2.78
25.917 0.02 0.72 0.777 O | | | |
2.77
26.000 0.02 0.72 0.772 O | | | |
2.75
26.083 0.01 0.72 0.767 O | | | |
2.74
26.167 0.01 0.72 0.762 O | | | |
2.72
26.250 0.01 0.72 0.758 O | | | |

2.71
26.333 0.01 0.72 0.753 O | | | |
2.69
26.417 0.00 0.72 0.748 O | | | |
2.67
26.500 0.00 0.72 0.743 O | | | |
2.66
26.583 0.00 0.72 0.738 O | | | |
2.64
26.667 0.00 0.72 0.733 O | | | |
2.63
26.750 0.00 0.72 0.728 O | | | |
2.61
26.833 0.00 0.72 0.723 O | | | |
2.60
26.917 0.00 0.72 0.718 O | | | |
2.58
27.000 0.00 0.72 0.713 O | | | |
2.56
27.083 0.00 0.72 0.708 O | | | |
2.55
27.167 0.00 0.72 0.703 O | | | |
2.53
27.250 0.00 0.72 0.698 O | | | |
2.52
27.333 0.00 0.72 0.693 O | | | |
2.50
27.417 0.00 0.72 0.688 O | | | |
2.48
27.500 0.00 0.72 0.683 O | | | |
2.47
27.583 0.00 0.72 0.678 O | | | |
2.45
27.667 0.00 0.72 0.673 O | | | |
2.44
27.750 0.00 0.72 0.668 O | | | |
2.42
27.833 0.00 0.72 0.663 O | | | |
2.41
27.917 0.00 0.72 0.658 O | | | |
2.39
28.000 0.00 0.72 0.654 O | | | |
2.37
28.083 0.00 0.72 0.649 O | | | |
2.36
28.167 0.00 0.72 0.644 O | | | |
2.34
28.250 0.00 0.72 0.639 O | | | |
2.33
28.333 0.00 0.72 0.634 O | | | |
2.31
28.417 0.00 0.72 0.629 O | | | |
2.30
28.500 0.00 0.72 0.624 O | | | |
2.28
28.583 0.00 0.72 0.619 O | | | |
2.26
28.667 0.00 0.72 0.614 O | | | |
2.25
28.750 0.00 0.72 0.609 O | | | |

2.23
28.833 0.00 0.72 0.604 O | | | |
2.22
28.917 0.00 0.72 0.599 O | | | |
2.20
29.000 0.00 0.72 0.594 O | | | |
2.18
29.083 0.00 0.72 0.589 O | | | |
2.17
29.167 0.00 0.72 0.584 O | | | |
2.15
29.250 0.00 0.72 0.579 O | | | |
2.14
29.333 0.00 0.72 0.574 O | | | |
2.12
29.417 0.00 0.72 0.569 O | | | |
2.11
29.500 0.00 0.72 0.564 O | | | |
2.09
29.583 0.00 0.72 0.559 O | | | |
2.07
29.667 0.00 0.72 0.554 O | | | |
2.06
29.750 0.00 0.72 0.549 O | | | |
2.04
29.833 0.00 0.72 0.544 O | | | |
2.03
29.917 0.00 0.72 0.539 O | | | |
2.01
30.000 0.00 0.72 0.535 O | | | |
1.99
30.083 0.00 0.72 0.530 O | | | |
1.98
30.167 0.00 0.72 0.525 O | | | |
1.96
30.250 0.00 0.72 0.520 O | | | |
1.94
30.333 0.00 0.72 0.515 O | | | |
1.92
30.417 0.00 0.72 0.510 O | | | |
1.91
30.500 0.00 0.72 0.505 O | | | |
1.89
30.583 0.00 0.72 0.500 O | | | |
1.87
30.667 0.00 0.72 0.495 O | | | |
1.85
30.750 0.00 0.72 0.490 O | | | |
1.84
30.833 0.00 0.72 0.485 O | | | |
1.82
30.917 0.00 0.72 0.480 O | | | |
1.80
31.000 0.00 0.72 0.475 O | | | |
1.78
31.083 0.00 0.72 0.470 O | | | |
1.77
31.167 0.00 0.72 0.465 O | | | |
1.75
31.250 0.00 0.72 0.460 O | | | |

1.73
31.333 0.00 0.72 0.455 O | | | |
1.71
31.417 0.00 0.72 0.450 O | | | |
1.70
31.500 0.00 0.72 0.445 O | | | |
1.68
31.583 0.00 0.72 0.440 O | | | |
1.66
31.667 0.00 0.72 0.435 O | | | |
1.64
31.750 0.00 0.72 0.430 O | | | |
1.63
31.833 0.00 0.72 0.425 O | | | |
1.61
31.917 0.00 0.72 0.420 O | | | |
1.59
32.000 0.00 0.72 0.416 O | | | |
1.57
32.083 0.00 0.72 0.411 O | | | |
1.56
32.167 0.00 0.72 0.406 O | | | |
1.54
32.250 0.00 0.72 0.401 O | | | |
1.52
32.333 0.00 0.72 0.396 O | | | |
1.50
32.417 0.00 0.72 0.391 O | | | |
1.49
32.500 0.00 0.72 0.386 O | | | |
1.47
32.583 0.00 0.72 0.381 O | | | |
1.45
32.667 0.00 0.72 0.376 O | | | |
1.43
32.750 0.00 0.72 0.371 O | | | |
1.42
32.833 0.00 0.72 0.366 O | | | |
1.40
32.917 0.00 0.72 0.361 O | | | |
1.38
33.000 0.00 0.72 0.356 O | | | |
1.36
33.083 0.00 0.72 0.351 O | | | |
1.35
33.167 0.00 0.72 0.346 O | | | |
1.33
33.250 0.00 0.72 0.341 O | | | |
1.31
33.333 0.00 0.72 0.336 O | | | |
1.29
33.417 0.00 0.72 0.331 O | | | |
1.28
33.500 0.00 0.72 0.326 O | | | |
1.26
33.583 0.00 0.72 0.321 O | | | |
1.24
33.667 0.00 0.72 0.316 O | | | |
1.22
33.750 0.00 0.72 0.311 O | | | |

1.21
33.833 0.00 0.72 0.306 O | | | |
1.19
33.917 0.00 0.72 0.301 O | | | |
1.17
34.000 0.00 0.72 0.296 O | | | |
1.15
34.083 0.00 0.72 0.292 O | | | |
1.14
34.167 0.00 0.72 0.287 O | | | |
1.12
34.250 0.00 0.72 0.282 O | | | |
1.10
34.333 0.00 0.72 0.277 O | | | |
1.08
34.417 0.00 0.72 0.272 O | | | |
1.07
34.500 0.00 0.72 0.267 O | | | |
1.05
34.583 0.00 0.72 0.262 O | | | |
1.03
34.667 0.00 0.72 0.257 O | | | |
1.01
34.750 0.00 0.72 0.252 O | | | |
1.00
34.833 0.00 0.70 0.247 O | | | |
0.98
34.917 0.00 0.69 0.242 O | | | |
0.96
35.000 0.00 0.68 0.237 O | | | |
0.94
35.083 0.00 0.66 0.233 O | | | |
0.92
35.167 0.00 0.65 0.228 O | | | |
0.90
35.250 0.00 0.64 0.224 O | | | |
0.89
35.333 0.00 0.62 0.220 O | | | |
0.87
35.417 0.00 0.61 0.215 O | | | |
0.85
35.500 0.00 0.60 0.211 O | | | |
0.83
35.583 0.00 0.59 0.207 O | | | |
0.82
35.667 0.00 0.58 0.203 O | | | |
0.80
35.750 0.00 0.57 0.199 O | | | |
0.79
35.833 0.00 0.56 0.195 O | | | |
0.77
35.917 0.00 0.54 0.191 O | | | |
0.76
36.000 0.00 0.53 0.188 O | | | |
0.74
36.083 0.00 0.52 0.184 O | | | |
0.73
36.167 0.00 0.51 0.181 O | | | |
0.71
36.250 0.00 0.50 0.177 O | | | |

0.70
36.333 0.00 0.49 0.174 O | | | |
0.69
36.417 0.00 0.48 0.170 O | | | |
0.67
36.500 0.00 0.47 0.167 O | | | |
0.66
36.583 0.00 0.47 0.164 O | | | |
0.65
36.667 0.00 0.46 0.160 O | | | |
0.63
36.750 0.00 0.45 0.157 O | | | |
0.62
36.833 0.00 0.44 0.154 O | | | |
0.61
36.917 0.00 0.43 0.151 O | | | |
0.60
37.000 0.00 0.42 0.148 O | | | |
0.59
37.083 0.00 0.41 0.145 O | | | |
0.58
37.167 0.00 0.41 0.143 O | | | |
0.56
37.250 0.00 0.40 0.140 O | | | |
0.55
37.333 0.00 0.39 0.137 O | | | |
0.54
37.417 0.00 0.38 0.135 O | | | |
0.53
37.500 0.00 0.38 0.132 O | | | |
0.52
37.583 0.00 0.37 0.129 O | | | |
0.51
37.667 0.00 0.36 0.127 O | | | |
0.50
37.750 0.00 0.35 0.124 O | | | |
0.49
37.833 0.00 0.35 0.122 O | | | |
0.48
37.917 0.00 0.34 0.120 O | | | |
0.47
38.000 0.00 0.33 0.117 O | | | |
0.46
38.083 0.00 0.33 0.115 O | | | |
0.45
38.167 0.00 0.32 0.113 O | | | |
0.45
38.250 0.00 0.31 0.111 O | | | |
0.44
38.333 0.00 0.31 0.108 O | | | |
0.43
38.417 0.00 0.30 0.106 O | | | |
0.42
38.500 0.00 0.30 0.104 O | | | |
0.41
38.583 0.00 0.29 0.102 O | | | |
0.40
38.667 0.00 0.29 0.100 O | | | |
0.40
38.750 0.00 0.28 0.098 O | | | |

0.39
38.833 0.00 0.27 0.096 O | | | |
0.38
38.917 0.00 0.27 0.095 O | | | |
0.37
39.000 0.00 0.26 0.093 O | | | |
0.37
39.083 0.00 0.26 0.091 O | | | |
0.36
39.167 0.00 0.25 0.089 O | | | |
0.35
39.250 0.00 0.25 0.087 O | | | |
0.35
39.333 0.00 0.24 0.086 O | | | |
0.34
39.417 0.00 0.24 0.084 O | | | |
0.33
39.500 0.00 0.23 0.082 O | | | |
0.33
39.583 0.00 0.23 0.081 O | | | |
0.32
39.667 0.00 0.23 0.079 O | | | |
0.31
39.750 0.00 0.22 0.078 O | | | |
0.31
39.833 0.00 0.22 0.076 O | | | |
0.30
39.917 0.00 0.21 0.075 O | | | |
0.30
40.000 0.00 0.21 0.073 O | | | |
0.29
40.083 0.00 0.20 0.072 O | | | |
0.28
40.167 0.00 0.20 0.070 O | | | |
0.28
40.250 0.00 0.20 0.069 O | | | |
0.27
40.333 0.00 0.19 0.068 O | | | |
0.27
40.417 0.00 0.19 0.066 O | | | |
0.26
40.500 0.00 0.19 0.065 O | | | |
0.26
40.583 0.00 0.18 0.064 O | | | |
0.25
40.667 0.00 0.18 0.063 O | | | |
0.25
40.750 0.00 0.17 0.061 O | | | |
0.24
40.833 0.00 0.17 0.060 O | | | |
0.24
40.917 0.00 0.17 0.059 O | | | |
0.23
41.000 0.00 0.16 0.058 O | | | |
0.23
41.083 0.00 0.16 0.057 O | | | |
0.22
41.167 0.00 0.16 0.056 O | | | |
0.22
41.250 0.00 0.16 0.055 O | | | |

0.22
41.333 0.00 0.15 0.054 O | | | |
0.21
41.417 0.00 0.15 0.053 O | | | |
0.21
41.500 0.00 0.15 0.051 O | | | |
0.20
41.583 0.00 0.14 0.050 O | | | |
0.20
41.667 0.00 0.14 0.050 O | | | |
0.20
41.750 0.00 0.14 0.049 O | | | |
0.19
41.833 0.00 0.14 0.048 O | | | |
0.19
41.917 0.00 0.13 0.047 O | | | |
0.18
42.000 0.00 0.13 0.046 O | | | |
0.18
42.083 0.00 0.13 0.045 O | | | |
0.18
42.167 0.00 0.13 0.044 O | | | |
0.17
42.250 0.00 0.12 0.043 O | | | |
0.17
42.333 0.00 0.12 0.042 O | | | |
0.17
42.417 0.00 0.12 0.042 O | | | |
0.16
42.500 0.00 0.12 0.041 O | | | |
0.16
42.583 0.00 0.11 0.040 O | | | |
0.16
42.667 0.00 0.11 0.039 O | | | |
0.15
42.750 0.00 0.11 0.038 O | | | |
0.15
42.833 0.00 0.11 0.038 O | | | |
0.15
42.917 0.00 0.11 0.037 O | | | |
0.15
43.000 0.00 0.10 0.036 O | | | |
0.14
43.083 0.00 0.10 0.035 O | | | |
0.14
43.167 0.00 0.10 0.035 O | | | |
0.14
43.250 0.00 0.10 0.034 O | | | |
0.13
43.333 0.00 0.10 0.033 O | | | |
0.13
43.417 0.00 0.09 0.033 O | | | |
0.13
43.500 0.00 0.09 0.032 O | | | |
0.13
43.583 0.00 0.09 0.032 O | | | |
0.12
43.667 0.00 0.09 0.031 O | | | |
0.12
43.750 0.00 0.09 0.030 O | | | |

0.12
43.833 0.00 0.08 0.030 O | | | |
0.12
43.917 0.00 0.08 0.029 O | | | |
0.12
44.000 0.00 0.08 0.029 O | | | |
0.11
44.083 0.00 0.08 0.028 O | | | |
0.11
44.167 0.00 0.08 0.027 O | | | |
0.11
44.250 0.00 0.08 0.027 O | | | |
0.11
44.333 0.00 0.08 0.026 O | | | |
0.10
44.417 0.00 0.07 0.026 O | | | |
0.10
44.500 0.00 0.07 0.025 O | | | |
0.10
44.583 0.00 0.07 0.025 O | | | |
0.10
44.667 0.00 0.07 0.024 O | | | |
0.10
44.750 0.00 0.07 0.024 O | | | |
0.09
44.833 0.00 0.07 0.024 O | | | |
0.09
44.917 0.00 0.07 0.023 O | | | |
0.09
45.000 0.00 0.06 0.023 O | | | |
0.09
45.083 0.00 0.06 0.022 O | | | |
0.09
45.167 0.00 0.06 0.022 O | | | |
0.09
45.250 0.00 0.06 0.021 O | | | |
0.08
45.333 0.00 0.06 0.021 O | | | |
0.08
45.417 0.00 0.06 0.020 O | | | |
0.08
45.500 0.00 0.06 0.020 O | | | |
0.08
45.583 0.00 0.06 0.020 O | | | |
0.08
45.667 0.00 0.05 0.019 O | | | |
0.08
45.750 0.00 0.05 0.019 O | | | |
0.07
45.833 0.00 0.05 0.019 O | | | |
0.07
45.917 0.00 0.05 0.018 O | | | |
0.07
46.000 0.00 0.05 0.018 O | | | |
0.07
46.083 0.00 0.05 0.018 O | | | |
0.07
46.167 0.00 0.05 0.017 O | | | |
0.07
46.250 0.00 0.05 0.017 O | | | |

0.07
46.333 0.00 0.05 0.017 O | | | |
0.07
46.417 0.00 0.05 0.016 O | | | |
0.06
46.500 0.00 0.05 0.016 O | | | |
0.06
46.583 0.00 0.04 0.016 O | | | |
0.06
46.667 0.00 0.04 0.015 O | | | |
0.06
46.750 0.00 0.04 0.015 O | | | |
0.06
46.833 0.00 0.04 0.015 O | | | |
0.06
46.917 0.00 0.04 0.014 O | | | |
0.06
47.000 0.00 0.04 0.014 O | | | |
0.06
47.083 0.00 0.04 0.014 O | | | |
0.05
47.167 0.00 0.04 0.014 O | | | |
0.05
47.250 0.00 0.04 0.013 O | | | |
0.05
47.333 0.00 0.04 0.013 O | | | |
0.05
47.417 0.00 0.04 0.013 O | | | |
0.05
47.500 0.00 0.04 0.013 O | | | |
0.05
47.583 0.00 0.04 0.012 O | | | |
0.05
47.667 0.00 0.03 0.012 O | | | |
0.05
47.750 0.00 0.03 0.012 O | | | |
0.05
47.833 0.00 0.03 0.012 O | | | |
0.05
47.917 0.00 0.03 0.011 O | | | |
0.04
48.000 0.00 0.03 0.011 O | | | |
0.04
48.083 0.00 0.03 0.011 O | | | |
0.04
48.167 0.00 0.03 0.011 O | | | |
0.04
48.250 0.00 0.03 0.011 O | | | |
0.04
48.333 0.00 0.03 0.010 O | | | |
0.04
48.417 0.00 0.03 0.010 O | | | |
0.04
48.500 0.00 0.03 0.010 O | | | |
0.04
48.583 0.00 0.03 0.010 O | | | |
0.04
48.667 0.00 0.03 0.010 O | | | |
0.04
48.750 0.00 0.03 0.009 O | | | |

0.04
48.833 0.00 0.03 0.009 O | | | |
0.04
48.917 0.00 0.03 0.009 O | | | |
0.04
49.000 0.00 0.03 0.009 O | | | |
0.03
49.083 0.00 0.02 0.009 O | | | |
0.03
49.167 0.00 0.02 0.008 O | | | |
0.03
49.250 0.00 0.02 0.008 O | | | |
0.03
49.333 0.00 0.02 0.008 O | | | |
0.03
49.417 0.00 0.02 0.008 O | | | |
0.03
49.500 0.00 0.02 0.008 O | | | |
0.03
49.583 0.00 0.02 0.008 O | | | |
0.03
49.667 0.00 0.02 0.008 O | | | |
0.03
49.750 0.00 0.02 0.007 O | | | |
0.03
49.833 0.00 0.02 0.007 O | | | |
0.03
49.917 0.00 0.02 0.007 O | | | |
0.03
50.000 0.00 0.02 0.007 O | | | |
0.03
50.083 0.00 0.02 0.007 O | | | |
0.03
50.167 0.00 0.02 0.007 O | | | |
0.03
50.250 0.00 0.02 0.007 O | | | |
0.03
50.333 0.00 0.02 0.006 O | | | |
0.03
50.417 0.00 0.02 0.006 O | | | |
0.02
50.500 0.00 0.02 0.006 O | | | |
0.02
50.583 0.00 0.02 0.006 O | | | |
0.02
50.667 0.00 0.02 0.006 O | | | |
0.02
50.750 0.00 0.02 0.006 O | | | |
0.02
50.833 0.00 0.02 0.006 O | | | |
0.02
50.917 0.00 0.02 0.006 O | | | |
0.02
51.000 0.00 0.02 0.006 O | | | |
0.02
51.083 0.00 0.02 0.005 O | | | |
0.02
51.167 0.00 0.02 0.005 O | | | |
0.02
51.250 0.00 0.01 0.005 O | | | |

0.02								
51.333	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.417	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.500	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.583	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.667	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.750	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.833	0.00	0.01	0.005	O	|	|	|	|
0.02								
51.917	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.000	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.083	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.167	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.250	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.333	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.417	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.500	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.583	0.00	0.01	0.004	O	|	|	|	|
0.02								
52.667	0.00	0.01	0.004	O	|	|	|	|
0.01								
52.750	0.00	0.01	0.004	O	|	|	|	|
0.01								
52.833	0.00	0.01	0.004	O	|	|	|	|
0.01								
52.917	0.00	0.01	0.004	O	|	|	|	|
0.01								
53.000	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.083	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.167	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.250	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.333	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.417	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.500	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.583	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.667	0.00	0.01	0.003	O	|	|	|	|
0.01								
53.750	0.00	0.01	0.003	O	|	|	|	|

0.01
53.833 0.00 0.01 0.003 O | | | |
0.01
53.917 0.00 0.01 0.003 O | | | |
0.01
54.000 0.00 0.01 0.003 O | | | |
0.01
54.083 0.00 0.01 0.003 O | | | |
0.01
54.167 0.00 0.01 0.003 O | | | |
0.01
54.250 0.00 0.01 0.003 O | | | |
0.01
54.333 0.00 0.01 0.003 O | | | |
0.01
54.417 0.00 0.01 0.002 O | | | |
0.01
54.500 0.00 0.01 0.002 O | | | |
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 61.417    0.00    0.00      0.000  O       |       |       |       |
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 61.500    0.00    0.00      0.000  O       |       |       |       |
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 61.667    0.00    0.00      0.000  O       |       |       |       |
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 62.083    0.00    0.00      0.000  O       |       |       |       |
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 62.167    0.00    0.00      0.000  O       |       |       |       |
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 62.417    0.00    0.00      0.000  O       |       |       |       |
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 62.667    0.00    0.00      0.000  O       |       |       |       |
0.00
 62.750    0.00    0.00      0.000  O       |       |       |       |
0.00

      ****************************HYDROGRAPH
DATA***************************
                  Number of intervals =   753
                  Time interval =    5.0 (Min.)
                  Maximum/Peak flow rate =       13.054 (CFS)
                  Total volume =       3.548 (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 C:
PROJECT HYDRAULIC CALCULATIONS

Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Friday, Jul 8 2022

Pena Outlet - Prelim Design - Parkway Drain - 6ft 4in opening

Rectangular Weir

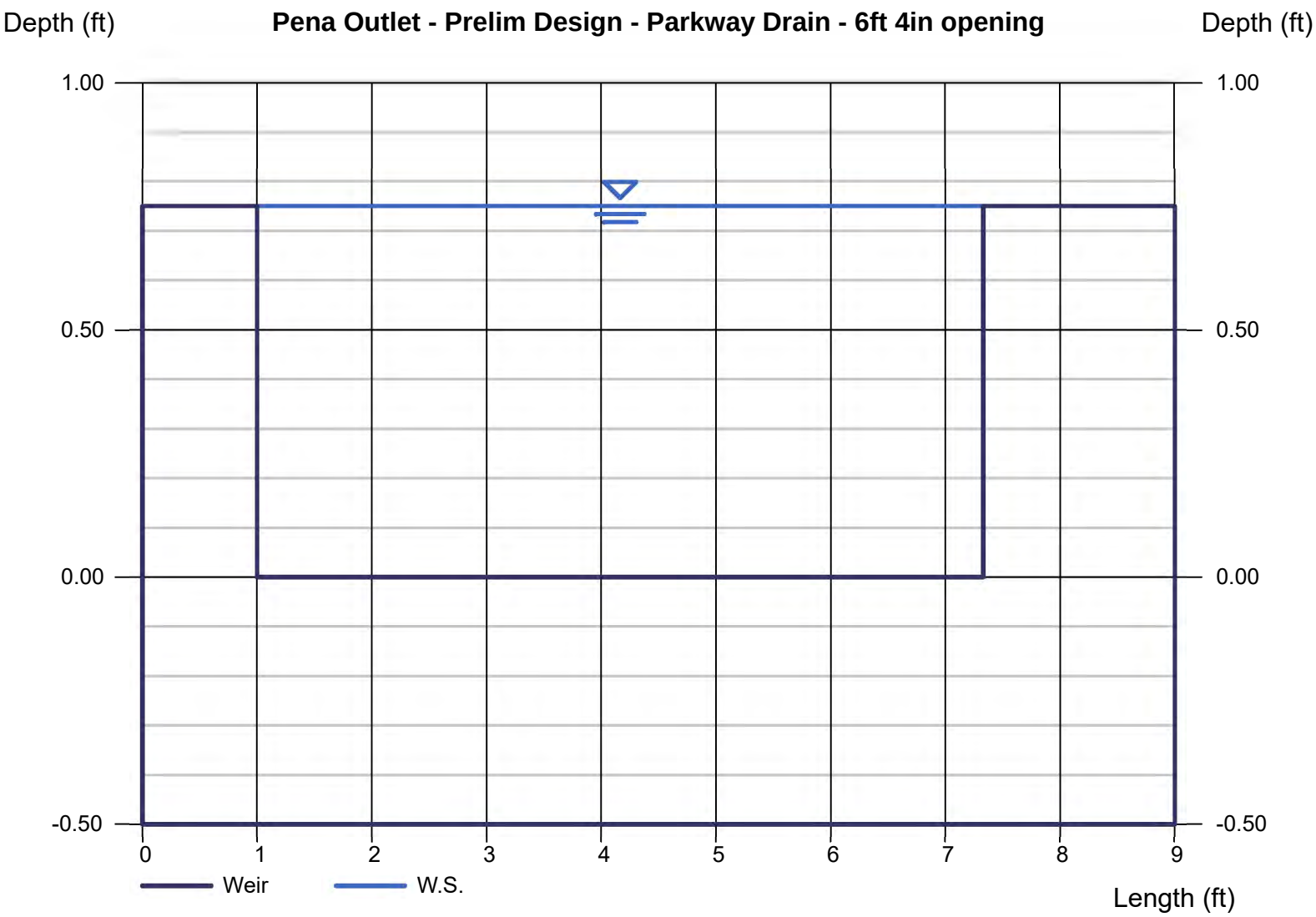
Crest	=	Sharp
Bottom Length (ft)	=	6.33
Total Depth (ft)	=	0.75

Calculations

Weir Coeff. Cw	=	3.33
Compute by:		Q vs Depth
No. Increments	=	10

Highlighted

Depth (ft)	=	0.75
Q (cfs)	=	13.69
Area (sqft)	=	4.75
Velocity (ft/s)	=	2.88
Top Width (ft)	=	6.33



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Thursday, Oct 22 2015

Street Capacity 0.5% BC to BC - 10 year

User-defined

Invert Elev (ft)	=	0.30
Slope (%)	=	0.50
N-Value	=	0.015

Calculations

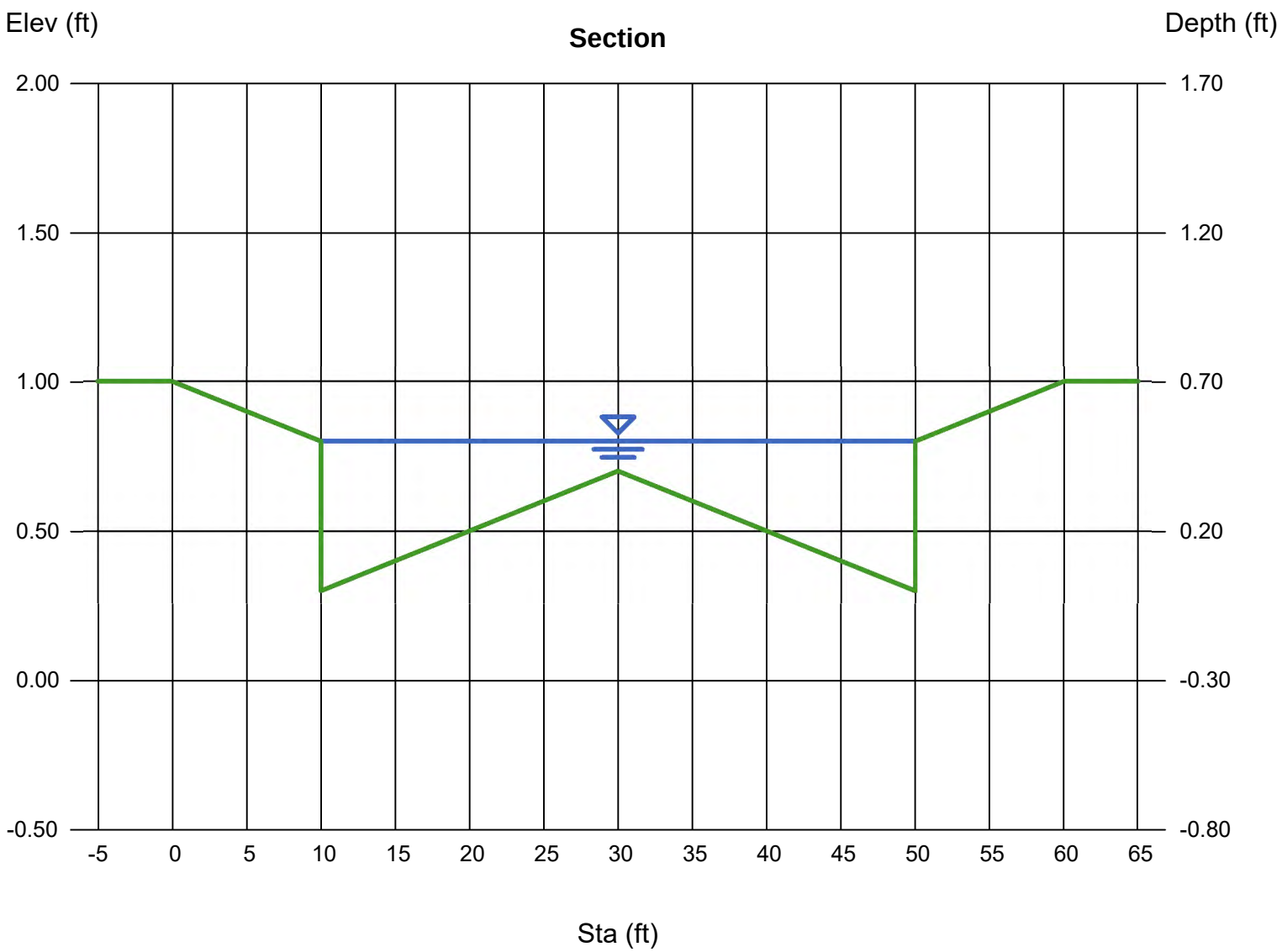
Compute by:		Known Depth
Known Depth (ft)	=	0.50

Highlighted

Depth (ft)	=	0.50
Q (cfs)	=	37.13
Area (sqft)	=	12.00
Velocity (ft/s)	=	3.09
Wetted Perim (ft)	=	41.00
Crit Depth, Yc (ft)	=	0.50
Top Width (ft)	=	40.01
EGL (ft)	=	0.65

(Sta, El, n)-(Sta, El, n)...

(0.00, 1.00)-(10.00, 0.80, 0.035)-(10.01, 0.30, 0.015)-(30.00, 0.70, 0.015)-(50.00, 0.30, 0.015)-(50.01, 0.80, 0.015)-(60.00, 1.00, 0.035)



Channel Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. Thursday, Oct 22 2015

Street Capacity 0.5% ROW to ROW - 100 year

User-defined

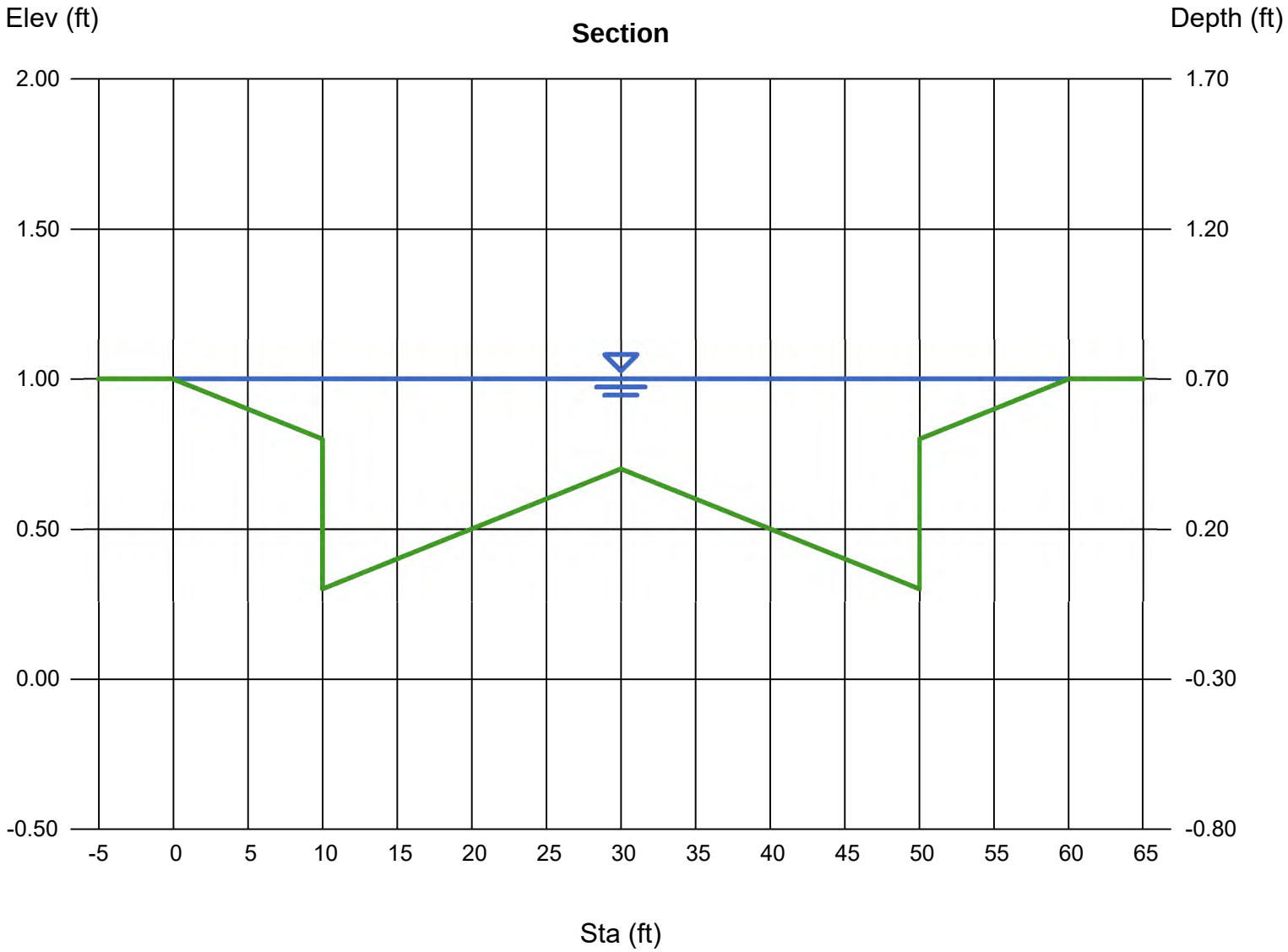
Invert Elev (ft)	= 0.30
Slope (%)	= 0.50
N-Value	= Composite

Calculations

Compute by:	Q vs Depth
No. Increments	= 1

Highlighted

Depth (ft)	= 0.70
Q (cfs)	= 52.09
Area (sqft)	= 22.00
Velocity (ft/s)	= 2.37
Wetted Perim (ft)	= 60.99
Crit Depth, Yc (ft)	= 0.01
Top Width (ft)	= 60.00
EGL (ft)	= 0.79

(Sta, El, n)-(Sta, El, n)...

(0.00, 1.00)-(10.00, 0.80, 0.035)-(10.01, 0.30, 0.015)-(30.00, 0.70, 0.015)-(50.00, 0.30, 0.015)-(50.01, 0.80, 0.015)-(60.00, 1.00, 0.035)