Appendix I-1

Preliminary Water Quality Management Plan

November 13, 2019
2019-185

Hesperia Commerce II
Industrial Buildings
City of Hesperia, CA

Preliminary Drainage Report

Prepared For:
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Table of Contents

I. Purpose and Scope 2

II. Project Site and Drainage Area Overview 2

III. Methodology 3

IV. Hydrology 3

V. Conclusion 4

Appendix 5

Post-Development Condition Hydrology Calculations .....***Error! Bookmark not defined.***

Attachments

Post-Development Condition Hydrology Calculations .....

A. Rational Method

10-Year Storm Frequency

2. 100-Year Storm Frequency

b. Unit Hydrograph Method

1. 10-Year Storm Frequency, 3-Hours Duration

2. 10-Year Storm Frequency, 24-Hours Duration

3. 100-Year Storm Frequency, 3-Hours Duration

4. 100-Year Storm Frequency, 24-Hours Duration

Underground CMP Capacity Calculations ..... *III*

Pre- & Post-development Hydrology Exhibits.....*Pocket-IV*

I. Purpose and Scope

The purpose of this study is to identify onsite and offsite surface flow tributary to the proposed development. Mitigate the additional runoff volume by constructing an above ground retention basin to capture the additional runoff for a 2-year, 10-year and 100-year storm for a 24-hour storm event. This study is to evaluate the Post-Development Hydrological Condition and the Pre-Development Hydrological Condition. The hydrology study also provides the criteria for the design of the on-site storm drain systems for flood protection of the proposed structures. The project site will construct 2 buildings, parking areas, street improvements, above ground infiltration/ retention basins, and storm drain infrastructure. The project site is located in the City of Hesperia.

The scope of the study includes the following:

1. *Perform 100-year, 10-year and 2-year rational method calculations for the onsite and offsite portions of street area as outlined in the San Bernardino County Flood Control Hydrology Manual.*
2. *Perform 100-year, 10-year, and 2-year unit hydrograph calculations to be utilized in the hydrologic conditions of concern analyses utilizing the San Bernardino County Flood Control Hydrology Manual.*
3. *Determine peak flow rates tributary to the mainline systems.*
4. *Size the infiltration/retention basin using the volumes determined from the unit hydrograph calculations.*
5. *Preparation of a report, which consists of hydrological and hydraulic results, as well as supporting exhibits.*

II. Project Site and Drainage Area Overview

The proposed site will be an industrial development located near the southwest corner of Yucca Terrace Drive and Highway 395 in Hesperia, California. The project site is bounded by roads and can be located with the provided information below:

- *South of Yucca Terrace Dr*
- *East of La Bureau of Power and Light Rd*
- *West of Caliente Rd and Highway 395*
- *North of Phelan Road*

The site consists of several parcels both irregular and rectangular in shape which approximate to 185 acres. The site is entirely vacant and undeveloped and surrounded by mostly paved/dirt roads. The existing natural cover consists primarily of shrubs, native bushes and trees throughout the site. The highest elevation per survey data is located on the south westerly corner of the project site. A small portion of the site sheet flows towards the south and another portion will sheet flow towards the west. Majority of the site will sheet flow towards the northerly east corner of the project site. Overall the site depicts slopes of approximately 2± percent towards the northerly east corner of the project site. The slopes at which sheet flow towards the south and west side of the project side slopes downward at a gradient of approximately 7± percent. Existing drainage patterns can be seen on the "Existing Development" in the Appendix where the site was separated into drainage areas and sub areas for further hydrological analysis to be completed as part of the Preliminary Hydrology Report. The drainage areas

where separated per the corresponding drainage patterns to better understand the site conditions and runoff produced.

Based on the Precise Grading Plans and provided Site Plan, the proposed development will consist of 2 warehouse buildings and 1 general building. Building 1 is located on the northern section of the project site which is approximately 1,561,248± ft^2 in size. Building 2 is located on the southern section of the project site which is approximately 2,059,825± ft^2. And Building 3 will be approximately 110,638± ft^2. The site is currently being developed as an industrial site where the warehouses will contain loading docks for day to day activities. The site is designed to allow runoff to sheet flow into the nearest catch basin. The site entirely directs runoff away from buildings. Runoff is then routed to the above ground basin where it will serve as the final destination for all runoff produced on the site. An above ground infiltration/ retention system is located on the eastern side of the project site, west of Building 3.

III. Methodology

The San Bernardino County Hydrology Manual (Reference 1), was used to develop the hydrological parameters for the hydrology analysis. The rational method and unit hydrograph method were used in order to perform a hydrological analysis for the existing and proposed project conditions. The proposed development will be designed utilize the 100-year flood protection criteria.

Civil Design Software, Version 8.1 was used for the 10-year & 100-year Hydrological Analysis imputing the following information:

- *10-year AMC III*
- *100-year AMC III*
- *Soil Type A*
- *Manning's Values Used:*
    - *Existing Surface n=0.030*
- *Project is located in the "Desert" area*

IV. Hydrology

The rainfall depths used in the hydrology calculations are as follows:

Storm Event & Duration	***Rainfall (inches)***
2-Year, 1-Hour	*0.448*
2-Year, 6-Hour	*1.08*
2-Year, 24-Hour	*2.03*
10-Year, 1-Hour	*0.773*
100-Year, 1-Hour	*1.29*
100-Year, 6-Hour	*2.99*
100-Year, 24-Hour	*6.28*

The rainfall depths were obtained from NOAA Atlas 14, which is included as part of the Appendix.

The existing classification for the area consists of Hydrologic Soil Group "B." For a 2-year storm event, the AMC I was utilized whereas AMC III was utilized for a 100-year storm event. The onsite are classified as "commercial" where 85% or more was considered to be impervious and "commercial landscaping" as land cover per the San Bernardino Hydrology Manual. Subareas were divided based upon the proposed drainage patterns to better analyze the runoff produced throughout each area. Although there are multiple areas identified, all areas have a share the final discharge point located at the above ground basin. The proposed site was split into four drainage areas. The rational method was computed for each area in order to obtain a time of concentration which would later be utilized as a user input when performing an analysis using the unit hydrograph.

This proposed development intends to build 3 industrial buildings, 2 of which while incorporate loading docks for everyday activities. The site will primarily drain directly into the detention/infiltration basins located between Building 1 and Building 3. The site is intended to retain 90 percent of the difference of volume produced between Post-Developed and Pre-Developed Conditions. The 100-year storm will produce approximately 3,640,889 ft^3 and 2,633,019 ft^3 volume of water for Post-Developed and Pre-Developed Conditions respectively. 90 percent of the difference is 907,083 ft^3 of runoff which will be detained on site with the proposed above surface basins.

V. Conclusion

In conclusion, this drainage study shows that the proposed development will be provided enough on-site detention volumes and the flows shall be mitigated for the proposed development. The proposed two proposed above ground detention basins shall be mitigating the on-site flows. It has no flood risk to any neighbors and will not have an impact to the public storm drain system. The proposed on-site storm drains and two detention/infiltration basins will be designed to convey the runoff and will comply with the flood protection & WQMP requirements of the City of Hesperia and County of San Bernardino.

Appendix

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: 11/04/19

JOB NO. 2019-185
2-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA A
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

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Process from Point/Station 1.100 to Point/Station 1.200
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.100(In/Hr)
Initial subarea data:
Initial area flow distance = 410.000(Ft.)
Top (of initial area) elevation = 3575.900(Ft.)
Bottom (of initial area) elevation = 3573.000(Ft.)
Difference in elevation = 2.900(Ft.)
Slope = 0.00707 s(%)= 0.71
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.080 min.
Rainfall intensity = 1.680(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.846
Subarea runoff = 5.077(CFS)

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Total initial stream area =        3.570(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)


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Process from Point/Station        1.200 to Point/Station        1.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3570.000(Ft.)
Downstream point/station elevation =  3562.800(Ft.)
Pipe length  =  1448.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.077(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.077(CFS)
Normal flow depth in pipe =   10.95(In.)
Flow top width inside pipe =   17.57(In.)
Critical Depth =   10.41(In.)
Pipe flow velocity =      4.52(Ft/s)
Travel time through pipe =    5.35 min.
Time of concentration (TC) =    14.42 min.


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Process from Point/Station        1.200 to Point/Station        1.300
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.570(Ac.)
Runoff from this stream =      5.077(CFS)
Time of concentration =   14.42 min.
Rainfall intensity =     1.215(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


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Process from Point/Station        1.800 to Point/Station        1.900
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1700     Max loss rate(Fm)=     0.170(In/Hr)
Initial subarea data:
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  3566.900(Ft.)
Bottom (of initial area) elevation =  3565.900(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00256  s(%)=       0.26
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TC = k(0.316)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.348 min.
Rainfall intensity =      1.437(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.794
Subarea runoff =      3.855(CFS)
Total initial stream area =        3.380(Ac.)
Pervious area fraction = 0.170
Initial area Fm value =    0.170(In/Hr)


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Process from Point/Station        1.900 to Point/Station        1.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3565.000(Ft.)
Downstream point/station elevation =  3562.800(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.855(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.855(CFS)
Normal flow depth in pipe =    5.92(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =   10.01(In.)
Pipe flow velocity =      9.98(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.42 min.


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Process from Point/Station        1.900 to Point/Station        1.300
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.380(Ac.)
Runoff from this stream =      3.855(CFS)
Time of concentration =   11.42 min.
Rainfall intensity =     1.431(In/Hr)
Area averaged loss rate (Fm) =    0.1700(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1700
Summary of stream data:

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


1      5.08     3.570     14.42    0.100      1.215
2      3.86     3.380     11.42    0.170      1.431
Qmax(1) =
           1.000 *    1.000 *     5.077) +
           0.829 *    1.000 *     3.855) + =       8.273
Qmax(2) =
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           1.193 *    0.792 *     5.077) +
           1.000 *    1.000 *     3.855) + =       8.653

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.077       3.855
Maximum flow rates at confluence using above data:
        8.273        8.653
Area of streams before confluence:
        3.570        3.380
Effective area values after confluence:
        6.950        6.207
Results of confluence:
Total flow rate =      8.653(CFS)
Time of concentration =    11.423 min.
Effective stream area after confluence =      6.207(Ac.)
Study area average Pervious fraction(Ap) =  0.134
Study area average soil loss rate(Fm) =    0.134(In/Hr)
Study area total (this main stream) =       6.95(Ac.)


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Process from Point/Station        1.300 to Point/Station        1.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3562.800(Ft.)
Downstream point/station elevation =  3557.900(Ft.)
Pipe length  =   960.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.653(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.653(CFS)
Normal flow depth in pipe =   13.76(In.)
Flow top width inside pipe =   19.96(In.)
Critical Depth =   13.11(In.)
Pipe flow velocity =      5.19(Ft/s)
Travel time through pipe =    3.09 min.
Time of concentration (TC) =    14.51 min.


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Process from Point/Station        1.200 to Point/Station        1.400
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.4900     Max loss rate(Fm)=     0.490(In/Hr)
Time of concentration =    14.51 min.
Rainfall intensity =      1.210(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
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rational method)(Q=KCIA) is C = 0.657
Subarea runoff =      2.077(CFS) for    7.280(Ac.)
Total runoff =     10.730(CFS)
Effective area this stream =       13.49(Ac.)
Total Study Area (Main Stream No. 1) =       14.23(Ac.)
Area averaged Fm value =    0.326(In/Hr)


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Process from Point/Station        1.400 to Point/Station        1.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3557.900(Ft.)
Downstream point/station elevation =  3548.200(Ft.)
Pipe length  =  1958.00(Ft.)   Manning's N = 0.013
No. of pipes = 4  Required pipe flow  =    10.730(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.683(CFS)
Normal flow depth in pipe =    8.29(In.)
Flow top width inside pipe =   14.92(In.)
Critical Depth =    7.89(In.)
Pipe flow velocity =      3.86(Ft/s)
Travel time through pipe =    8.46 min.
Time of concentration (TC) =    22.97 min.


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Process from Point/Station        1.400 to Point/Station        1.500
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    22.97 min.
Rainfall intensity =      0.877(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.755
Subarea runoff =     22.278(CFS) for   36.350(Ac.)
Total runoff =     33.008(CFS)
Effective area this stream =       49.84(Ac.)
Total Study Area (Main Stream No. 1) =       50.58(Ac.)
Area averaged Fm value =    0.161(In/Hr)


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Process from Point/Station        1.500 to Point/Station        1.600
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  3548.200(Ft.)
Downstream point/station elevation =  3546.600(Ft.)
Pipe length  =   307.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.008(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    33.008(CFS)
Normal flow depth in pipe =   23.67(In.)
Flow top width inside pipe =   29.72(In.)
Critical Depth =   22.95(In.)
Pipe flow velocity =      7.23(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =    23.68 min.


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Process from Point/Station        1.500 to Point/Station        1.600
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.400(In/Hr)
Time of concentration =    23.68 min.
Rainfall intensity =      0.859(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.744
Subarea runoff =      0.503(CFS) for    2.580(Ac.)
Total runoff =     33.512(CFS)
Effective area this stream =       52.42(Ac.)
Total Study Area (Main Stream No. 1) =       53.16(Ac.)
Area averaged Fm value =    0.173(In/Hr)


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Process from Point/Station        1.600 to Point/Station        1.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  3546.600(Ft.)
Downstream point/station elevation =  3545.300(Ft.)
Pipe length  =   263.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.512(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    33.512(CFS)
Normal flow depth in pipe =   24.52(In.)
Flow top width inside pipe =   28.84(In.)
Critical Depth =   23.13(In.)
Pipe flow velocity =      7.09(Ft/s)
Travel time through pipe =    0.62 min.
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Time of concentration (TC) = 24.30 min.

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Process from Point/Station 1.700 to Point/Station 5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 3545.300(Ft.)
Downstream point/station elevation = 3544.700(Ft.)
Pipe length = 119.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 33.512(CFS)
Nearest computed pipe diameter = 33.00(In.)
Calculated individual pipe flow = 33.512(CFS)
Normal flow depth in pipe = 24.30(In.)
Flow top width inside pipe = 29.07(In.)
Critical Depth = 23.13(In.)
Pipe flow velocity = 7.15(Ft/s)
Travel time through pipe = 0.28 min.
Time of concentration (TC) = 24.57 min.
End of computations, Total Study Area = 53.16 (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) = 0.172
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: 11/04/19

JOB NO. 2019-185
2-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA B
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

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Process from Point/Station 2.100 to Point/Station 2.200
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.100(In/Hr)
Initial subarea data:
Initial area flow distance = 562.000(Ft.)
Top (of initial area) elevation = 3570.800(Ft.)
Bottom (of initial area) elevation = 3564.500(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01121 s(%)= 1.12
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.394 min.
Rainfall intensity = 1.641(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.845
Subarea runoff = 11.771(CFS)

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Total initial stream area =        8.490(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)


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Process from Point/Station        2.200 to Point/Station        2.300
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   1.647(Ft.), Average velocity =   6.646(Ft/s)
!!Warning: Water is above left or right bank elevations
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.67
        2              0.00              0.00
        3              2.00              0.16
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =     20.828(CFS)
  '     '        flow top width =      2.000(Ft.)
  '     '    velocity=    6.646(Ft/s)
  '     '        area =      3.134(Sq.Ft)
  '     '        Froude number =     0.936

Upstream point elevation =  3564.500(Ft.)
Downstream point elevation =  3562.300(Ft.)
Flow length =   603.180(Ft.)
Travel time  =    1.51 min.
Time of concentration =   10.91 min.
Depth of flow =   1.647(Ft.)
Average velocity =   6.646(Ft/s)
Total irregular channel flow =    20.828(CFS)
Irregular channel normal depth above invert elev. =   1.647(Ft.)
Average velocity of channel(s) =   6.646(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Rainfall intensity =      1.478(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.839
Subarea runoff =     18.050(CFS) for   15.560(Ac.)
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Total runoff =     29.822(CFS)
Effective area this stream =       24.05(Ac.)
Total Study Area (Main Stream No. 1) =       24.05(Ac.)
Area averaged Fm value =    0.100(In/Hr)
Depth of flow =   2.023(Ft.), Average velocity =   7.673(Ft/s)
!!Warning: Water is above left or right bank elevations


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Process from Point/Station        2.300 to Point/Station        2.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3558.300(Ft.)
Downstream point/station elevation =  3549.500(Ft.)
Pipe length  =  1778.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.822(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    29.822(CFS)
Normal flow depth in pipe =   22.36(In.)
Flow top width inside pipe =   30.85(In.)
Critical Depth =   21.79(In.)
Pipe flow velocity =      6.96(Ft/s)
Travel time through pipe =    4.26 min.
Time of concentration (TC) =    15.17 min.


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Process from Point/Station        2.300 to Point/Station        2.400
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    15.17 min.
Rainfall intensity =      1.173(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.823
Subarea runoff =     42.554(CFS) for   50.880(Ac.)
Total runoff =     72.376(CFS)
Effective area this stream =       74.93(Ac.)
Total Study Area (Main Stream No. 1) =       74.93(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.400 to Point/Station        5.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  3549.500(Ft.)
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   952.40(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    72.376(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    72.376(CFS)
Normal flow depth in pipe =   31.69(In.)
Flow top width inside pipe =   41.08(In.)
Critical Depth =   31.46(In.)
Pipe flow velocity =      8.72(Ft/s)
Travel time through pipe =    1.82 min.
Time of concentration (TC) =    16.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.400 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.3000     Max loss rate(Fm)=     0.300(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     69.850(CFS)
therefore the upstream flow rate of Q =     72.376(CFS) is being used
Time of concentration =    16.99 min.
Rainfall intensity =      1.084(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.807
Subarea runoff =      0.000(CFS) for    4.980(Ac.)
Total runoff =     72.376(CFS)
Effective area this stream =       79.91(Ac.)
Total Study Area (Main Stream No. 1) =       79.91(Ac.)
Area averaged Fm value =    0.112(In/Hr)
End of computations, Total Study Area =           79.91 (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) = 0.112
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: 11/04/19

JOB NO. 2019-185
2-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA C
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++
Process from Point/Station 3.100 to Point/Station 3.200
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.2400 Max loss rate(Fm)= 0.240(In/Hr)
Initial subarea data:
Initial area flow distance = 626.680(Ft.)
Top (of initial area) elevation = 3575.100(Ft.)
Bottom (of initial area) elevation = 3563.500(Ft.)
Difference in elevation = 11.600(Ft.)
Slope = 0.01851 s(%)= 1.85
TC = k(0.334)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.743 min.
Rainfall intensity = 1.599(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.765
Subarea runoff = 8.600(CFS)
Total initial stream area = 7.030(Ac.)
Pervious area fraction = 0.240
Initial area Fm value = 0.240(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.200 to Point/Station        3.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3563.500(Ft.)
Downstream point/station elevation =  3553.900(Ft.)
Pipe length  =  2518.29(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.600(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.600(CFS)
Normal flow depth in pipe =   15.28(In.)
Flow top width inside pipe =   18.70(In.)
Critical Depth =   13.08(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    9.15 min.
Time of concentration (TC) =    18.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.200 to Point/Station        3.300
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    18.89 min.
Rainfall intensity =      1.006(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.789
Subarea runoff =     23.778(CFS) for   33.760(Ac.)
Total runoff =     32.378(CFS)
Effective area this stream =       40.79(Ac.)
Total Study Area (Main Stream No. 1) =       40.79(Ac.)
Area averaged Fm value =    0.124(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.300 to Point/Station        2.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3553.900(Ft.)
Downstream point/station elevation =  3548.300(Ft.)
Pipe length  =  1475.83(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.378(CFS)
```

```
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    32.378(CFS)
Normal flow depth in pipe =   26.86(In.)
Flow top width inside pipe =   25.69(In.)
Critical Depth =   22.71(In.)
Pipe flow velocity =      6.25(Ft/s)
Travel time through pipe =    3.93 min.
Time of concentration (TC) =    22.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.300 to Point/Station        2.500
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.3300     Max loss rate(Fm)=     0.330(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =     32.281(CFS)
therefore the upstream flow rate of Q =     32.378(CFS) is being used
Time of concentration =    22.82 min.
Rainfall intensity =      0.881(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.760
Subarea runoff =      0.000(CFS) for    7.420(Ac.)
Total runoff =     32.378(CFS)
Effective area this stream =       48.21(Ac.)
Total Study Area (Main Stream No. 1) =       48.21(Ac.)
Area averaged Fm value =    0.156(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.500 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3548.300(Ft.)
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   709.60(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.378(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    32.378(CFS)
Normal flow depth in pipe =   23.58(In.)
Flow top width inside pipe =   29.81(In.)
Critical Depth =   22.71(In.)
Pipe flow velocity =      7.13(Ft/s)
Travel time through pipe =    1.66 min.
Time of concentration (TC) =    24.48 min.
End of computations, Total Study Area =           48.21 (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) = 0.156
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: 11/04/19

JOB NO. 2019-185
2-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA D
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.441 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 4.100 to Point/Station 4.200
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.5300 Max loss rate(Fm)= 0.530(In/Hr)
Initial subarea data:
Initial area flow distance = 291.000(Ft.)
Top (of initial area) elevation = 3529.000(Ft.)
Bottom (of initial area) elevation = 3527.700(Ft.)
Difference in elevation = 1.300(Ft.)
Slope = 0.00447 s(%)= 0.45
TC = k(0.405)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.567 min.
Rainfall intensity = 1.396(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.558
Subarea runoff = 7.794(CFS)
Total initial stream area = 10.000(Ac.)
Pervious area fraction = 0.530
Initial area Fm value = 0.530(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station        4.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
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 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Initial subarea data:
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  3535.700(Ft.)
Bottom (of initial area) elevation =  3534.100(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00337  s(%)=       0.34
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.170 min.
Rainfall intensity =      1.431(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.837
Subarea runoff =      2.934(CFS)
Total initial stream area =        2.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)
End of computations, Total Study Area =           12.45 (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) = 0.445
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: 11/04/19

JOB NO. 2019-185
10-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA A
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.773 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 1.100 to Point/Station 1.200
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 410.000(Ft.)
Top (of initial area) elevation = 3575.900(Ft.)
Bottom (of initial area) elevation = 3573.000(Ft.)
Difference in elevation = 2.900(Ft.)
Slope = 0.00707 s(%)= 0.71
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.080 min.
Rainfall intensity = 2.899(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.870
Subarea runoff = 9.000(CFS)
Total initial stream area = 3.570(Ac.)

```
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.200 to Point/Station        1.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  3570.000(Ft.)
Downstream point/station elevation =  3562.800(Ft.)
Pipe length  =  1448.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.000(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.000(CFS)
Normal flow depth in pipe =   14.27(In.)
Flow top width inside pipe =   19.60(In.)
Critical Depth =   13.37(In.)
Pipe flow velocity =      5.17(Ft/s)
Travel time through pipe =    4.67 min.
Time of concentration (TC) =    13.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.200 to Point/Station        1.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.570(Ac.)
Runoff from this stream =      9.000(CFS)
Time of concentration =   13.75 min.
Rainfall intensity =     2.168(In/Hr)
Area averaged loss rate (Fm) =    0.0978(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.800 to Point/Station        1.900
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.1700     Max loss rate(Fm)=     0.166(In/Hr)
Initial subarea data:
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  3566.900(Ft.)
Bottom (of initial area) elevation =  3565.900(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00256  s(%)=       0.26
TC = k(0.316)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.348 min.
```

```
Rainfall intensity =      2.480(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.840
Subarea runoff =      7.038(CFS)
Total initial stream area =        3.380(Ac.)
Pervious area fraction = 0.170
Initial area Fm value =    0.166(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.900 to Point/Station        1.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3565.000(Ft.)
Downstream point/station elevation =  3562.800(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.038(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.038(CFS)
Normal flow depth in pipe =    8.85(In.)
Flow top width inside pipe =   10.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.34(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.900 to Point/Station        1.300
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.380(Ac.)
Runoff from this stream =      7.038(CFS)
Time of concentration =   11.41 min.
Rainfall intensity =     2.470(In/Hr)
Area averaged loss rate (Fm) =    0.1662(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1700
Summary of stream data:

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


1      9.00     3.570     13.75    0.098      2.168
2      7.04     3.380     11.41    0.166      2.470
Qmax(1) =
           1.000 *    1.000 *     9.000) +
           0.869 *    1.000 *     7.038) + =      15.116
Qmax(2) =
           1.146 *    0.830 *     9.000) +
           1.000 *    1.000 *     7.038) + =      15.599
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       9.000       7.038
Maximum flow rates at confluence using above data:
       15.116       15.599
Area of streams before confluence:
        3.570        3.380
Effective area values after confluence:
        6.950        6.343
Results of confluence:
Total flow rate =     15.599(CFS)
Time of concentration =    11.414 min.
Effective stream area after confluence =      6.343(Ac.)
Study area average Pervious fraction(Ap) =  0.134
Study area average soil loss rate(Fm) =    0.131(In/Hr)
Study area total (this main stream) =       6.95(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.300 to Point/Station        1.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3562.800(Ft.)
Downstream point/station elevation =  3557.900(Ft.)
Pipe length  =   960.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.599(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    15.599(CFS)
Normal flow depth in pipe =   18.96(In.)
Flow top width inside pipe =   19.55(In.)
Critical Depth =   17.08(In.)
Pipe flow velocity =      5.86(Ft/s)
Travel time through pipe =    2.73 min.
Time of concentration (TC) =    14.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.200 to Point/Station        1.400
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.4900     Max loss rate(Fm)=     0.479(In/Hr)
Time of concentration =    14.14 min.
Rainfall intensity =      2.126(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.766
Subarea runoff =      6.576(CFS) for    7.280(Ac.)
Total runoff =     22.175(CFS)
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```
Effective area this stream =       13.62(Ac.)
Total Study Area (Main Stream No. 1) =       14.23(Ac.)
Area averaged Fm value =    0.317(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.400 to Point/Station        1.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3557.900(Ft.)
Downstream point/station elevation =  3548.200(Ft.)
Pipe length  =  1958.00(Ft.)   Manning's N = 0.013
No. of pipes = 4  Required pipe flow  =    22.175(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.544(CFS)
Normal flow depth in pipe =   11.63(In.)
Flow top width inside pipe =   17.22(In.)
Critical Depth =   10.90(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    7.11 min.
Time of concentration (TC) =    21.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.400 to Point/Station        1.500
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    21.25 min.
Rainfall intensity =      1.598(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.811
Subarea runoff =     42.631(CFS) for   36.350(Ac.)
Total runoff =     64.806(CFS)
Effective area this stream =       49.97(Ac.)
Total Study Area (Main Stream No. 1) =       50.58(Ac.)
Area averaged Fm value =    0.158(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.500 to Point/Station        1.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3548.200(Ft.)
Downstream point/station elevation =  3546.600(Ft.)
```

```
Pipe length  =   307.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    64.806(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    64.806(CFS)
Normal flow depth in pipe =   30.94(In.)
Flow top width inside pipe =   37.00(In.)
Critical Depth =   30.29(In.)
Pipe flow velocity =      8.53(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    21.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.500 to Point/Station        1.600
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.391(In/Hr)
Time of concentration =    21.85 min.
Rainfall intensity =      1.568(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.803
Subarea runoff =      1.345(CFS) for    2.580(Ac.)
Total runoff =     66.152(CFS)
Effective area this stream =       52.55(Ac.)
Total Study Area (Main Stream No. 1) =       53.16(Ac.)
Area averaged Fm value =    0.169(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.600 to Point/Station        1.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3546.600(Ft.)
Downstream point/station elevation =  3545.300(Ft.)
Pipe length  =   263.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.152(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    66.152(CFS)
Normal flow depth in pipe =   32.20(In.)
Flow top width inside pipe =   35.52(In.)
Critical Depth =   30.61(In.)
Pipe flow velocity =      8.36(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    22.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.700 to Point/Station        5.000
```

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 3545.300(Ft.)
Downstream point/station elevation = 3544.700(Ft.)
Pipe length = 119.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 66.152(CFS)
Nearest computed pipe diameter = 42.00(In.)
Calculated individual pipe flow = 66.152(CFS)
Normal flow depth in pipe = 31.92(In.)
Flow top width inside pipe = 35.87(In.)
Critical Depth = 30.61(In.)
Pipe flow velocity = 8.43(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 22.61 min.
End of computations, Total Study Area = 53.16 (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) = 0.172
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: 11/04/19

JOB NO. 2019-185
10-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA B
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.773 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 2.100 to Point/Station 2.200
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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) = 0.1000 Max loss rate(Fm)= 0.098(In/Hr)
Initial subarea data:
Initial area flow distance = 562.000(Ft.)
Top (of initial area) elevation = 3570.800(Ft.)
Bottom (of initial area) elevation = 3564.500(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01121 s(%)= 1.12
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.394 min.
Rainfall intensity = 2.831(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.869
Subarea runoff = 20.882(CFS)
Total initial stream area = 8.490(Ac.)

```
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.200 to Point/Station        2.300
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   2.313(Ft.), Average velocity =   8.418(Ft/s)
!!Warning: Water is above left or right bank elevations
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.67
        2              0.00              0.00
        3              2.00              0.16
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =     37.599(CFS)
  '     '        flow top width =      2.000(Ft.)
  '     '    velocity=    8.418(Ft/s)
  '     '        area =      4.467(Sq.Ft)
  '     '        Froude number =     0.993

Upstream point elevation =  3564.500(Ft.)
Downstream point elevation =  3562.300(Ft.)
Flow length =   603.180(Ft.)
Travel time  =    1.19 min.
Time of concentration =   10.59 min.
Depth of flow =   2.313(Ft.)
Average velocity =   8.418(Ft/s)
Total irregular channel flow =    37.599(CFS)
Irregular channel normal depth above invert elev. =   2.313(Ft.)
Average velocity of channel(s) =   8.418(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Rainfall intensity =      2.603(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.866
Subarea runoff =     33.348(CFS) for   15.560(Ac.)
Total runoff =     54.230(CFS)
Effective area this stream =       24.05(Ac.)
```

```
Total Study Area (Main Stream No. 1) =       24.05(Ac.)
Area averaged Fm value =    0.098(In/Hr)
Depth of flow =   2.862(Ft.), Average velocity =   9.746(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.300 to Point/Station        2.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3558.300(Ft.)
Downstream point/station elevation =  3549.500(Ft.)
Pipe length  =  1778.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.230(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    54.230(CFS)
Normal flow depth in pipe =   29.86(In.)
Flow top width inside pipe =   33.04(In.)
Critical Depth =   28.21(In.)
Pipe flow velocity =      7.95(Ft/s)
Travel time through pipe =    3.73 min.
Time of concentration (TC) =    14.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.300 to Point/Station        2.400
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    14.31 min.
Rainfall intensity =      2.108(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.858
Subarea runoff =     81.321(CFS) for   50.880(Ac.)
Total runoff =    135.551(CFS)
Effective area this stream =       74.93(Ac.)
Total Study Area (Main Stream No. 1) =       74.93(Ac.)
Area averaged Fm value =    0.098(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.400 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3549.500(Ft.)
```

```
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   952.40(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   135.551(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   135.551(CFS)
Normal flow depth in pipe =   42.94(In.)
Flow top width inside pipe =   43.59(In.)
Critical Depth =   41.09(In.)
Pipe flow velocity =     10.00(Ft/s)
Travel time through pipe =    1.59 min.
Time of concentration (TC) =    15.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.400 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.3000     Max loss rate(Fm)=     0.293(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    132.928(CFS)
therefore the upstream flow rate of Q =    135.551(CFS) is being used
Time of concentration =    15.90 min.
Rainfall intensity =      1.958(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.849
Subarea runoff =      0.000(CFS) for    4.980(Ac.)
Total runoff =    135.551(CFS)
Effective area this stream =       79.91(Ac.)
Total Study Area (Main Stream No. 1) =       79.91(Ac.)
Area averaged Fm value =    0.110(In/Hr)
End of computations, Total Study Area =           79.91 (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) = 0.112
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: 11/04/19

JOB NO. 2019-185
10-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA C
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.772 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 3.100 to Point/Station 3.200
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.2400 Max loss rate(Fm)= 0.235(In/Hr)
Initial subarea data:
Initial area flow distance = 626.680(Ft.)
Top (of initial area) elevation = 3575.100(Ft.)
Bottom (of initial area) elevation = 3563.500(Ft.)
Difference in elevation = 11.600(Ft.)
Slope = 0.01851 s(%)= 1.85
TC = k(0.334)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.743 min.
Rainfall intensity = 2.756(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.823
Subarea runoff = 15.951(CFS)
Total initial stream area = 7.030(Ac.)
Pervious area fraction = 0.240
Initial area Fm value = 0.235(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.200 to Point/Station        3.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  3563.500(Ft.)
Downstream point/station elevation =  3553.900(Ft.)
Pipe length  =  2518.29(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.951(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    15.951(CFS)
Normal flow depth in pipe =   18.84(In.)
Flow top width inside pipe =   24.79(In.)
Critical Depth =   16.73(In.)
Pipe flow velocity =      5.38(Ft/s)
Travel time through pipe =    7.80 min.
Time of concentration (TC) =    17.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.200 to Point/Station        3.300
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Time of concentration =    17.54 min.
Rainfall intensity =      1.826(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =     46.624(CFS) for   33.760(Ac.)
Total runoff =     62.575(CFS)
Effective area this stream =       40.79(Ac.)
Total Study Area (Main Stream No. 1) =       40.79(Ac.)
Area averaged Fm value =    0.121(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.300 to Point/Station        2.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  3553.900(Ft.)
Downstream point/station elevation =  3548.300(Ft.)
Pipe length  =  1475.83(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.575(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    62.575(CFS)
```

```
Normal flow depth in pipe =   31.59(In.)
Flow top width inside pipe =   41.16(In.)
Critical Depth =   29.18(In.)
Pipe flow velocity =      7.56(Ft/s)
Travel time through pipe =    3.25 min.
Time of concentration (TC) =    20.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.300 to Point/Station        2.500
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Pervious ratio(Ap) = 0.3300     Max loss rate(Fm)=     0.323(In/Hr)
Time of concentration =    20.80 min.
Rainfall intensity =      1.621(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.815
Subarea runoff =      1.140(CFS) for    7.420(Ac.)
Total runoff =     63.715(CFS)
Effective area this stream =       48.21(Ac.)
Total Study Area (Main Stream No. 1) =       48.21(Ac.)
Area averaged Fm value =    0.152(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.500 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3548.300(Ft.)
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   709.60(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    63.715(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    63.715(CFS)
Normal flow depth in pipe =   30.84(In.)
Flow top width inside pipe =   37.10(In.)
Critical Depth =   30.02(In.)
Pipe flow velocity =      8.42(Ft/s)
Travel time through pipe =    1.41 min.
Time of concentration (TC) =    22.20 min.
End of computations, Total Study Area =           48.21 (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) = 0.156
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: 11/04/19

JOB NO. 2019-185
10-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA D
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 10.0
Computed rainfall intensity:
Storm year = 10.00 1 hour rainfall = 0.773 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 2

++
Process from Point/Station 4.100 to Point/Station 4.200
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Pervious ratio(Ap) = 0.5300 Max loss rate(Fm)= 0.518(In/Hr)
Initial subarea data:
Initial area flow distance = 291.000(Ft.)
Top (of initial area) elevation = 3529.000(Ft.)
Bottom (of initial area) elevation = 3527.700(Ft.)
Difference in elevation = 1.300(Ft.)
Slope = 0.00447 s(%)= 0.45
TC = k(0.405)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.567 min.
Rainfall intensity = 2.447(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.709
Subarea runoff = 17.359(CFS)
Total initial stream area = 10.000(Ac.)
Pervious area fraction = 0.530
Initial area Fm value = 0.518(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station        4.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.098(In/Hr)
Initial subarea data:
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  3535.700(Ft.)
Bottom (of initial area) elevation =  3534.100(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00337  s(%)=       0.34
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.170 min.
Rainfall intensity =      2.507(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.865
Subarea runoff =      5.313(CFS)
Total initial stream area =        2.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.098(In/Hr)
End of computations, Total Study Area =           12.45 (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) = 0.445
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: 11/04/19

JOB NO. 2019-185
100-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA A
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++

Process from Point/Station 1.100 to Point/Station 1.200
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 410.000(Ft.)
Top (of initial area) elevation = 3575.900(Ft.)
Bottom (of initial area) elevation = 3573.000(Ft.)
Difference in elevation = 2.900(Ft.)
Slope = 0.00707 s(%)= 0.71
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.080 min.
Rainfall intensity = 4.838(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.885
Subarea runoff = 15.292(CFS)

```
Total initial stream area =        3.570(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.200 to Point/Station        1.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3570.000(Ft.)
Downstream point/station elevation =  3562.800(Ft.)
Pipe length  =  1448.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.292(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    15.292(CFS)
Normal flow depth in pipe =   18.84(In.)
Flow top width inside pipe =   19.71(In.)
Critical Depth =   16.91(In.)
Pipe flow velocity =      5.78(Ft/s)
Travel time through pipe =    4.17 min.
Time of concentration (TC) =    13.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.200 to Point/Station        1.300
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.570(Ac.)
Runoff from this stream =     15.292(CFS)
Time of concentration =   13.25 min.
Rainfall intensity =     3.713(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.800 to Point/Station        1.900
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1700     Max loss rate(Fm)=     0.133(In/Hr)
Initial subarea data:
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  3566.900(Ft.)
Bottom (of initial area) elevation =  3565.900(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00256  s(%)=       0.26
```

```
TC = k(0.316)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.348 min.
Rainfall intensity =      4.139(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.871
Subarea runoff =     12.184(CFS)
Total initial stream area =        3.380(Ac.)
Pervious area fraction = 0.170
Initial area Fm value =    0.133(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.900 to Point/Station        1.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3565.000(Ft.)
Downstream point/station elevation =  3562.800(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.184(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    12.184(CFS)
Normal flow depth in pipe =   10.65(In.)
Flow top width inside pipe =   13.61(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.07(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    11.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.900 to Point/Station        1.300
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.380(Ac.)
Runoff from this stream =     12.184(CFS)
Time of concentration =   11.41 min.
Rainfall intensity =     4.124(In/Hr)
Area averaged loss rate (Fm) =    0.1335(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1700
Summary of stream data:

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


1     15.29     3.570     13.25    0.079      3.713
2     12.18     3.380     11.41    0.133      4.124
Qmax(1) =
           1.000 *    1.000 *    15.292) +
           0.897 *    1.000 *    12.184) + =      26.219
Qmax(2) =
```

```
           1.113 *    0.861 *    15.292) +
           1.000 *    1.000 *    12.184) + =      26.833

Total of 2 streams to confluence:
Flow rates before confluence point:
      15.292      12.184
Maximum flow rates at confluence using above data:
       26.219       26.833
Area of streams before confluence:
        3.570        3.380
Effective area values after confluence:
        6.950        6.452
Results of confluence:
Total flow rate =     26.833(CFS)
Time of concentration =    11.405 min.
Effective stream area after confluence =      6.452(Ac.)
Study area average Pervious fraction(Ap) =  0.134
Study area average soil loss rate(Fm) =    0.105(In/Hr)
Study area total (this main stream) =       6.95(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.300 to Point/Station        1.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3562.800(Ft.)
Downstream point/station elevation =  3557.900(Ft.)
Pipe length  =   960.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.833(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    26.833(CFS)
Normal flow depth in pipe =   22.59(In.)
Flow top width inside pipe =   25.87(In.)
Critical Depth =   21.19(In.)
Pipe flow velocity =      6.77(Ft/s)
Travel time through pipe =    2.36 min.
Time of concentration (TC) =    13.77 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.200 to Point/Station        1.400
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.4900     Max loss rate(Fm)=     0.385(In/Hr)
Time of concentration =    13.77 min.
Rainfall intensity =      3.615(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
```

```
rational method)(Q=KCIA) is C = 0.837
Subarea runoff =     14.709(CFS) for    7.280(Ac.)
Total runoff =     41.543(CFS)
Effective area this stream =       13.73(Ac.)
Total Study Area (Main Stream No. 1) =       14.23(Ac.)
Area averaged Fm value =    0.253(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.400 to Point/Station        1.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3557.900(Ft.)
Downstream point/station elevation =  3548.200(Ft.)
Pipe length  =  1958.00(Ft.)   Manning's N = 0.013
No. of pipes = 4  Required pipe flow  =    41.543(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.386(CFS)
Normal flow depth in pipe =   16.03(In.)
Flow top width inside pipe =   17.85(In.)
Critical Depth =   14.40(In.)
Pipe flow velocity =      5.27(Ft/s)
Travel time through pipe =    6.20 min.
Time of concentration (TC) =    19.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.400 to Point/Station        1.500
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    19.96 min.
Rainfall intensity =      2.787(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.859
Subarea runoff =     78.373(CFS) for   36.350(Ac.)
Total runoff =    119.915(CFS)
Effective area this stream =       50.08(Ac.)
Total Study Area (Main Stream No. 1) =       50.58(Ac.)
Area averaged Fm value =    0.126(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.500 to Point/Station        1.600
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  3548.200(Ft.)
Downstream point/station elevation =  3546.600(Ft.)
Pipe length  =   307.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   119.915(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   119.915(CFS)
Normal flow depth in pipe =   41.06(In.)
Flow top width inside pipe =   40.40(In.)
Critical Depth =   39.17(In.)
Pipe flow velocity =      9.79(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    20.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.500 to Point/Station        1.600
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.314(In/Hr)
Time of concentration =    20.49 min.
Rainfall intensity =      2.737(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.855
Subarea runoff =      3.375(CFS) for    2.580(Ac.)
Total runoff =    123.290(CFS)
Effective area this stream =       52.66(Ac.)
Total Study Area (Main Stream No. 1) =       53.16(Ac.)
Area averaged Fm value =    0.136(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.600 to Point/Station        1.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  3546.600(Ft.)
Downstream point/station elevation =  3545.300(Ft.)
Pipe length  =   263.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   123.290(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   123.290(CFS)
Normal flow depth in pipe =   39.75(In.)
Flow top width inside pipe =   47.60(In.)
Critical Depth =   39.19(In.)
Pipe flow velocity =      9.83(Ft/s)
Travel time through pipe =    0.45 min.
```

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Time of concentration (TC) =    20.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.700 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3545.300(Ft.)
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   119.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   123.290(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   123.290(CFS)
Normal flow depth in pipe =   39.42(In.)
Flow top width inside pipe =   47.95(In.)
Critical Depth =   39.19(In.)
Pipe flow velocity =      9.91(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    21.13 min.
End of computations, Total Study Area =           53.16 (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) = 0.172
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: 11/04/19

JOB NO. 2019-185
100-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA B
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 2.100 to Point/Station 2.200
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
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) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 562.000(Ft.)
Top (of initial area) elevation = 3570.800(Ft.)
Bottom (of initial area) elevation = 3564.500(Ft.)
Difference in elevation = 6.300(Ft.)
Slope = 0.01121 s(%)= 1.12
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.394 min.
Rainfall intensity = 4.724(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.885
Subarea runoff = 35.496(CFS)

```
Total initial stream area =        8.490(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.200 to Point/Station        2.300
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   3.172(Ft.), Average velocity =  10.458(Ft/s)
!!Warning: Water is above left or right bank elevations
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              0.67
        2              0.00              0.00
        3              2.00              0.16
Manning's 'N' friction factor =   0.015
------------------------------------------------------------------
Sub-Channel flow  =     64.682(CFS)
  '     '        flow top width =      2.000(Ft.)
  '     '    velocity=   10.458(Ft/s)
  '     '        area =      6.185(Sq.Ft)
  '     '        Froude number =     1.048

Upstream point elevation =  3564.500(Ft.)
Downstream point elevation =  3562.300(Ft.)
Flow length =   603.180(Ft.)
Travel time  =    0.96 min.
Time of concentration =   10.36 min.
Depth of flow =   3.172(Ft.)
Average velocity =  10.458(Ft/s)
Total irregular channel flow =    64.682(CFS)
Irregular channel normal depth above invert elev. =   3.172(Ft.)
Average velocity of channel(s) =  10.458(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =      4.412(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.884
Subarea runoff =     58.313(CFS) for   15.560(Ac.)
```

```
Total runoff =     93.809(CFS)
Effective area this stream =       24.05(Ac.)
Total Study Area (Main Stream No. 1) =       24.05(Ac.)
Area averaged Fm value =    0.079(In/Hr)
Depth of flow =   3.945(Ft.), Average velocity =  12.135(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.300 to Point/Station        2.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3558.300(Ft.)
Downstream point/station elevation =  3549.500(Ft.)
Pipe length  =  1778.70(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    93.809(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =    93.809(CFS)
Normal flow depth in pipe =   36.56(In.)
Flow top width inside pipe =   40.90(In.)
Critical Depth =   35.21(In.)
Pipe flow velocity =      9.13(Ft/s)
Travel time through pipe =    3.25 min.
Time of concentration (TC) =    13.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.300 to Point/Station        2.400
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    13.60 min.
Rainfall intensity =      3.646(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =    146.748(CFS) for   50.880(Ac.)
Total runoff =    240.557(CFS)
Effective area this stream =       74.93(Ac.)
Total Study Area (Main Stream No. 1) =       74.93(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.400 to Point/Station        5.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  3549.500(Ft.)
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   952.40(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   240.557(CFS)
Nearest computed pipe diameter  =     69.00(In.)
Calculated individual pipe flow  =   240.557(CFS)
Normal flow depth in pipe =   51.00(In.)
Flow top width inside pipe =   60.60(In.)
Critical Depth =   51.48(In.)
Pipe flow velocity =     11.69(Ft/s)
Travel time through pipe =    1.36 min.
Time of concentration (TC) =    14.96 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.400 to Point/Station        5.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3000     Max loss rate(Fm)=     0.236(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =    238.948(CFS)
therefore the upstream flow rate of Q =    240.557(CFS) is being used
Time of concentration =    14.96 min.
Rainfall intensity =      3.411(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.877
Subarea runoff =      0.000(CFS) for    4.980(Ac.)
Total runoff =    240.557(CFS)
Effective area this stream =       79.91(Ac.)
Total Study Area (Main Stream No. 1) =       79.91(Ac.)
Area averaged Fm value =    0.088(In/Hr)
End of computations, Total Study Area =           79.91 (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) = 0.112
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: 11/04/19

JOB NO. 2019-185
100-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA C
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 3.100 to Point/Station 3.200
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.2400 Max loss rate(Fm)= 0.188(In/Hr)
Initial subarea data:
Initial area flow distance = 626.680(Ft.)
Top (of initial area) elevation = 3575.100(Ft.)
Bottom (of initial area) elevation = 3563.500(Ft.)
Difference in elevation = 11.600(Ft.)
Slope = 0.01851 s(%)= 1.85
TC = k(0.334)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.743 min.
Rainfall intensity = 4.605(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.863
Subarea runoff = 27.943(CFS)
Total initial stream area = 7.030(Ac.)
Pervious area fraction = 0.240
Initial area Fm value = 0.188(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.200 to Point/Station        3.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3563.500(Ft.)
Downstream point/station elevation =  3553.900(Ft.)
Pipe length  =  2518.29(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.943(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    27.943(CFS)
Normal flow depth in pipe =   23.48(In.)
Flow top width inside pipe =   29.90(In.)
Critical Depth =   21.06(In.)
Pipe flow velocity =      6.18(Ft/s)
Travel time through pipe =    6.79 min.
Time of concentration (TC) =    16.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.200 to Point/Station        3.300
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    16.54 min.
Rainfall intensity =      3.180(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.872
Subarea runoff =     85.205(CFS) for   33.760(Ac.)
Total runoff =    113.148(CFS)
Effective area this stream =       40.79(Ac.)
Total Study Area (Main Stream No. 1) =       40.79(Ac.)
Area averaged Fm value =    0.097(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.300 to Point/Station        2.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3553.900(Ft.)
Downstream point/station elevation =  3548.300(Ft.)
Pipe length  =  1475.83(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   113.148(CFS)
```

```
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   113.148(CFS)
Normal flow depth in pipe =   41.34(In.)
Flow top width inside pipe =   45.75(In.)
Critical Depth =   37.59(In.)
Pipe flow velocity =      8.65(Ft/s)
Travel time through pipe =    2.84 min.
Time of concentration (TC) =    19.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.300 to Point/Station        2.500
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.3300     Max loss rate(Fm)=     0.259(In/Hr)
Time of concentration =    19.38 min.
Rainfall intensity =      2.845(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.861
Subarea runoff =      5.007(CFS) for    7.420(Ac.)
Total runoff =    118.155(CFS)
Effective area this stream =       48.21(Ac.)
Total Study Area (Main Stream No. 1) =       48.21(Ac.)
Area averaged Fm value =    0.122(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.500 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  3548.300(Ft.)
Downstream point/station elevation =  3544.700(Ft.)
Pipe length  =   709.60(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   118.155(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   118.155(CFS)
Normal flow depth in pipe =   41.02(In.)
Flow top width inside pipe =   40.47(In.)
Critical Depth =   38.93(In.)
Pipe flow velocity =      9.66(Ft/s)
Travel time through pipe =    1.22 min.
Time of concentration (TC) =    20.60 min.
End of computations, Total Study Area =           48.21 (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) = 0.156
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: 11/04/19

JOB NO. 2019-185
100-YEAR RATIONAL METHOD
POST-PROJECT CONDITION FOR AREA D
HCCII, 11-04-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

++
Process from Point/Station 4.100 to Point/Station 4.200
**** INITIAL AREA EVALUATION ****

Soil classification AP and SCS values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.5300 Max loss rate(Fm)= 0.416(In/Hr)
Initial subarea data:
Initial area flow distance = 291.000(Ft.)
Top (of initial area) elevation = 3529.000(Ft.)
Bottom (of initial area) elevation = 3527.700(Ft.)
Difference in elevation = 1.300(Ft.)
Slope = 0.00447 s(%)= 0.45
TC = k(0.405)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.567 min.
Rainfall intensity = 4.084(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.808
Subarea runoff = 33.007(CFS)
Total initial stream area = 10.000(Ac.)
Pervious area fraction = 0.530
Initial area Fm value = 0.416(In/Hr)

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.300 to Point/Station        4.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
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) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  3535.700(Ft.)
Bottom (of initial area) elevation =  3534.100(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00337  s(%)=       0.34
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.170 min.
Rainfall intensity =      4.185(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =      9.054(CFS)
Total initial stream area =        2.450(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)
End of computations, Total Study Area =           12.45 (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) = 0.445
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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
POST-PROJECT CONDITION FOR AREA C
HCCII, 11-04-2019

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 10		
48.20	1	0.77
Rainfall data for year 2		
48.20	6	1.08
Rainfall data for year 2		
48.20	24	2.03
Rainfall data for year 100		
48.20	1	1.29

```
------------------------------------------------------------------------
Rainfall data for year 100
            48.20            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
            48.20           24           6.28
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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         48.20      1.000     0.785    0.160    0.126

Area-averaged adjusted loss rate Fm (In/Hr) =  0.126

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     7.71   0.160         32.0      52.0       9.23     0.229
    40.49   0.840         98.0      98.0       0.20     0.962

Area-averaged catchment yield fraction, Y =  0.845
Area-averaged low loss fraction, Yb =  0.155
User entry of time of concentration  =   0.340 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      48.20(Ac.)
Catchment Lag time =   0.272 hours
Unit interval =  15.000 minutes
Unit interval percentage of lag time = 91.9118
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.126(In/Hr)
Average low loss rate fraction (Yb) = 0.155 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of      48.20(Ac.) (Ref: fig. E-4)

5-minute factor = 0.998     Adjusted rainfall =  0.611(In)
30-minute factor = 0.998    Adjusted rainfall =  1.045(In)
1-hour factor = 0.998       Adjusted rainfall =  1.287(In)
```

3-hour factor = 1.000 Adjusted rainfall = 2.159(In)
6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 194.31 (CFS))		
1	14.582	28.334
2	63.711	95.460
3	81.800	35.148
4	89.884	15.709
5	94.300	8.581
6	96.928	5.106
7	98.295	2.656
8	99.333	2.018
9	100.000	1.296

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8492	0.0973
2	1.0454	0.0556
3	1.1807	0.0410
4	1.2871	0.0332
5	1.4297	0.0457
6	1.5579	0.0414
7	1.6752	0.0381
8	1.7839	0.0354
9	1.8857	0.0332
10	1.9816	0.0314
11	2.0726	0.0298
12	2.1593	0.0285
13	2.2420	0.0272
14	2.3213	0.0261
15	2.3977	0.0252
16	2.4715	0.0243
17	2.5428	0.0235
18	2.6119	0.0228
19	2.6791	0.0222
20	2.7444	0.0216
21	2.8079	0.0210
22	2.8699	0.0205
23	2.9304	0.0200
24	2.9895	0.0196
25	3.0556	0.0219
26	3.1204	0.0215
27	3.1841	0.0211

28	3.2467	0.0208
29	3.3083	0.0204
30	3.3689	0.0201
31	3.4286	0.0198
32	3.4873	0.0195
33	3.5453	0.0192
34	3.6024	0.0190
35	3.6587	0.0187
36	3.7143	0.0185
37	3.7692	0.0182
38	3.8234	0.0180
39	3.8770	0.0178
40	3.9299	0.0176
41	3.9822	0.0174
42	4.0339	0.0172
43	4.0850	0.0170
44	4.1356	0.0168
45	4.1857	0.0166
46	4.2352	0.0165
47	4.2842	0.0163
48	4.3328	0.0161
49	4.3809	0.0160
50	4.4285	0.0158
51	4.4757	0.0157
52	4.5225	0.0155
53	4.5689	0.0154
54	4.6148	0.0153
55	4.6604	0.0151
56	4.7056	0.0150
57	4.7504	0.0149
58	4.7948	0.0148
59	4.8389	0.0147
60	4.8826	0.0145
61	4.9260	0.0144
62	4.9691	0.0143
63	5.0118	0.0142
64	5.0543	0.0141
65	5.0964	0.0140
66	5.1382	0.0139
67	5.1798	0.0138
68	5.2210	0.0137
69	5.2620	0.0136
70	5.3027	0.0135
71	5.3431	0.0134
72	5.3832	0.0134
73	5.4231	0.0133
74	5.4628	0.0132
75	5.5022	0.0131
76	5.5414	0.0130
77	5.5803	0.0129
78	5.6190	0.0129

79	5.6574	0.0128
80	5.6956	0.0127
81	5.7336	0.0126
82	5.7714	0.0126
83	5.8090	0.0125
84	5.8464	0.0124
85	5.8835	0.0124
86	5.9205	0.0123
87	5.9572	0.0122
88	5.9938	0.0122
89	6.0302	0.0121
90	6.0664	0.0120
91	6.1023	0.0120
92	6.1382	0.0119
93	6.1738	0.0119
94	6.2092	0.0118
95	6.2445	0.0117
96	6.2796	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0351	0.0055	0.0297
2	0.0354	0.0055	0.0299
3	0.0357	0.0055	0.0301
4	0.0359	0.0056	0.0303
5	0.0362	0.0056	0.0306
6	0.0365	0.0057	0.0308
7	0.0368	0.0057	0.0311
8	0.0371	0.0058	0.0313
9	0.0374	0.0058	0.0316
10	0.0377	0.0059	0.0318
11	0.0380	0.0059	0.0321
12	0.0384	0.0060	0.0324
13	0.0387	0.0060	0.0327
14	0.0390	0.0061	0.0330
15	0.0394	0.0061	0.0333
16	0.0398	0.0062	0.0336
17	0.0402	0.0062	0.0339
18	0.0406	0.0063	0.0343
19	0.0410	0.0064	0.0346
20	0.0414	0.0064	0.0350
21	0.0419	0.0065	0.0354
22	0.0423	0.0066	0.0357
23	0.0428	0.0066	0.0361
24	0.0433	0.0067	0.0365
25	0.0438	0.0068	0.0370
26	0.0443	0.0069	0.0374
27	0.0448	0.0070	0.0379
28	0.0454	0.0070	0.0383

29	0.0460	0.0071	0.0389
30	0.0466	0.0072	0.0394
31	0.0472	0.0073	0.0399
32	0.0479	0.0074	0.0405
33	0.0486	0.0075	0.0411
34	0.0493	0.0077	0.0417
35	0.0501	0.0078	0.0423
36	0.0509	0.0079	0.0430
37	0.0518	0.0080	0.0437
38	0.0526	0.0082	0.0445
39	0.0536	0.0083	0.0453
40	0.0546	0.0085	0.0461
41	0.0557	0.0086	0.0470
42	0.0568	0.0088	0.0480
43	0.0580	0.0090	0.0490
44	0.0593	0.0092	0.0501
45	0.0607	0.0094	0.0513
46	0.0621	0.0096	0.0525
47	0.0638	0.0099	0.0539
48	0.0655	0.0102	0.0553
49	0.0593	0.0092	0.0501
50	0.0613	0.0095	0.0518
51	0.0638	0.0099	0.0539
52	0.0663	0.0103	0.0560
53	0.0694	0.0108	0.0586
54	0.0727	0.0113	0.0614
55	0.0767	0.0119	0.0648
56	0.0812	0.0126	0.0686
57	0.0872	0.0135	0.0736
58	0.0937	0.0145	0.0791
59	0.1025	0.0159	0.0866
60	0.1134	0.0176	0.0958
61	0.1298	0.0201	0.1096
62	0.1160	0.0180	0.0980
63	0.1414	0.0219	0.1194
64	0.3025	0.0314	0.2711
65	0.7368	0.0314	0.7054
66	0.1315	0.0204	0.1111
67	0.1119	0.0174	0.0945
68	0.0928	0.0144	0.0784
69	0.0805	0.0125	0.0680
70	0.0722	0.0112	0.0610
71	0.0659	0.0102	0.0557
72	0.0610	0.0095	0.0515
73	0.0653	0.0101	0.0551
74	0.0619	0.0096	0.0523
75	0.0591	0.0092	0.0499
76	0.0566	0.0088	0.0478
77	0.0544	0.0085	0.0460
78	0.0525	0.0082	0.0444
79	0.0508	0.0079	0.0429

80	0.0492	0.0076	0.0416
81	0.0478	0.0074	0.0404
82	0.0465	0.0072	0.0393
83	0.0453	0.0070	0.0383
84	0.0442	0.0069	0.0373
85	0.0432	0.0067	0.0365
86	0.0422	0.0066	0.0357
87	0.0413	0.0064	0.0349
88	0.0405	0.0063	0.0342
89	0.0397	0.0062	0.0336
90	0.0390	0.0061	0.0329
91	0.0383	0.0059	0.0324
92	0.0376	0.0058	0.0318
93	0.0370	0.0057	0.0313
94	0.0364	0.0057	0.0308
95	0.0359	0.0056	0.0303
96	0.0353	0.0055	0.0299

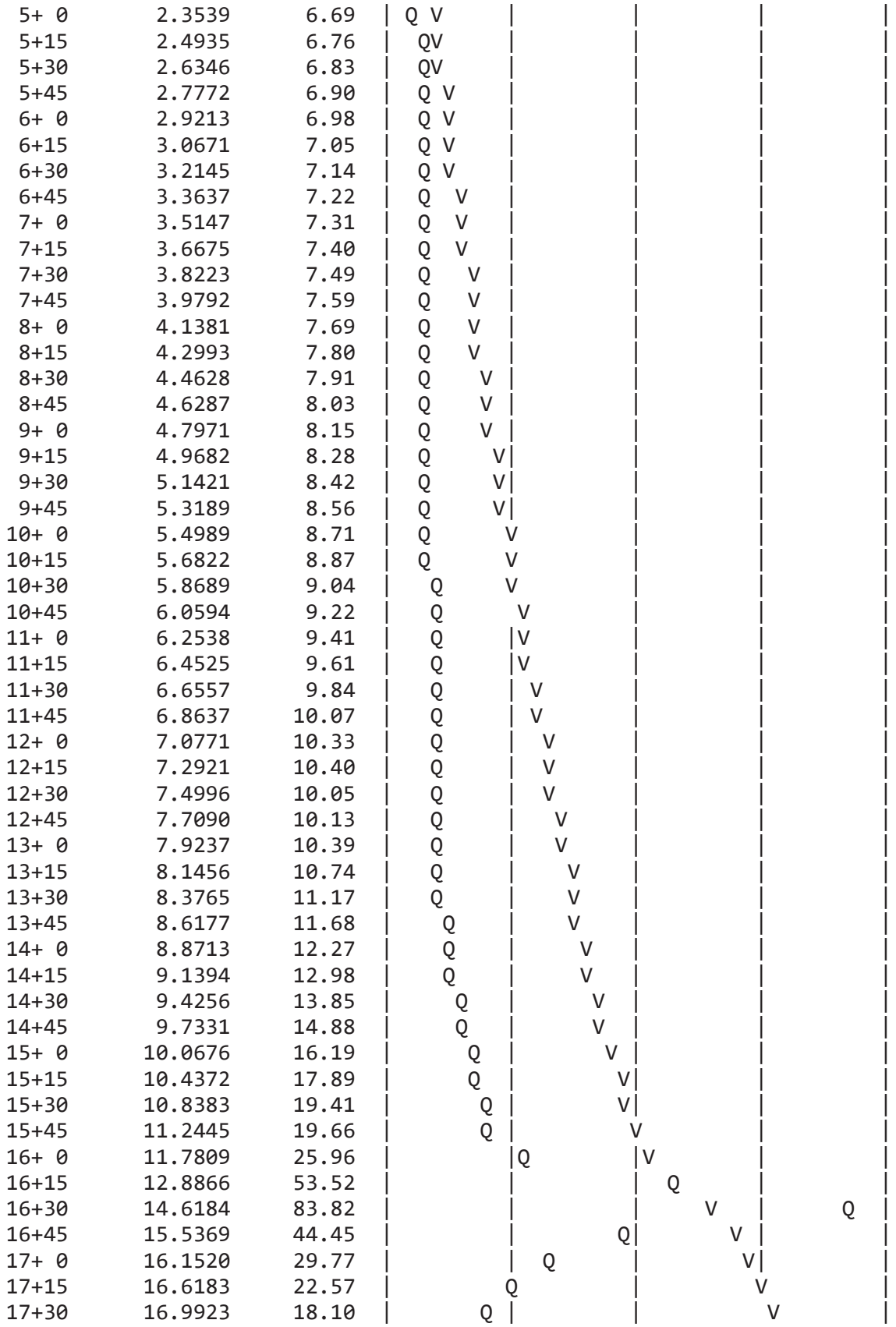
Total soil rain loss = 0.88(In)
Total effective rainfall = 5.40(In)
Peak flow rate in flood hydrograph = 83.82(CFS)

++

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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	22.5	45.0	67.5	90.0
0+15	0.0174	0.84	Q	|	|	|	|
0+30	0.0934	3.68	VQ	|	|	|	|
0+45	0.1915	4.75	V Q	|	|	|	|
1+ 0	0.3000	5.25	V Q	|	|	|	|
1+15	0.4146	5.55	V Q	|	|	|	|
1+30	0.5331	5.74	V Q	|	|	|	|
1+45	0.6543	5.86	|VQ	|	|	|	|
2+ 0	0.7776	5.97	|VQ	|	|	|	|
2+15	0.9028	6.06	|VQ	|	|	|	|
2+30	1.0289	6.11	|VQ	|	|	|	|
2+45	1.1561	6.16	| Q	|	|	|	|
3+ 0	1.2845	6.21	| Q	|	|	|	|
3+15	1.4139	6.26	| Q	|	|	|	|
3+30	1.5445	6.32	| Q	|	|	|	|
3+45	1.6762	6.38	| QV	|	|	|	|
4+ 0	1.8092	6.44	| QV	|	|	|	|
4+15	1.9434	6.50	| QV	|	|	|	|
4+30	2.0789	6.56	| QV	|	|	|	|
4+45	2.2157	6.62	| Q V	|	|	|	|



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   17+45      17.3017     14.97  |     Q   |         |         |V        |
   18+ 0      17.5747     13.21  |    Q    |         |         | V       |
   18+15      17.8179     11.77  |    Q    |         |         | V       |
   18+30      18.0419     10.84  |   Q     |         |         |  V      |
   18+45      18.2569     10.41  |   Q     |         |         |  V      |
   19+ 0      18.4625      9.95  |   Q     |         |         |   V     |
   19+15      18.6596      9.54  |   Q     |         |         |   V     |
   19+30      18.8491      9.17  |   Q     |         |         |   V     |
   19+45      19.0316      8.83  |  Q      |         |         |    V    |
   20+ 0      19.2080      8.54  |  Q      |         |         |    V    |
   20+15      19.3787      8.27  |  Q      |         |         |    V    |
   20+30      19.5443      8.01  |  Q      |         |         |     V   |
   20+45      19.7051      7.78  |  Q      |         |         |     V   |
   21+ 0      19.8616      7.57  |  Q      |         |         |     V   |
   21+15      20.0141      7.38  |  Q      |         |         |     V   |
   21+30      20.1630      7.20  |  Q      |         |         |      V  |
   21+45      20.3084      7.04  |  Q      |         |         |      V  |
   22+ 0      20.4507      6.89  |  Q      |         |         |      V  |
   22+15      20.5900      6.74  | Q       |         |         |      V  |
   22+30      20.7266      6.61  | Q       |         |         |       V |
   22+45      20.8605      6.48  | Q       |         |         |       V |
   23+ 0      20.9920      6.36  | Q       |         |         |       V |
   23+15      21.1212      6.25  | Q       |         |         |       V |
   23+30      21.2481      6.15  | Q       |         |         |        V|
   23+45      21.3730      6.04  | Q       |         |         |        V|
   24+ 0      21.4960      5.95  | Q       |         |         |        V|
   24+15      21.5998      5.02  | Q       |         |         |        V|
   24+30      21.6440      2.14  Q         |         |         |        V|
-------------------------------------------------------------------------
```

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
POST-PROJECT CONDITION FOR AREA D1
HCCII, 11-04-2019

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 10		
10.00	1	0.77
Rainfall data for year 2		
10.00	6	1.08
Rainfall data for year 2		
10.00	24	2.03
Rainfall data for year 100		
10.00	1	1.29

```
------------------------------------------------------------------------
Rainfall data for year 100
            10.00            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
            10.00           24           6.28
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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         10.00      1.000     0.785    0.510    0.400

Area-averaged adjusted loss rate Fm (In/Hr) =  0.400

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     5.10   0.510         32.0      52.0       9.23     0.229
     4.90   0.490         98.0      98.0       0.20     0.962

Area-averaged catchment yield fraction, Y =  0.588
Area-averaged low loss fraction, Yb =  0.412
User entry of time of concentration  =   0.190 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      10.00(Ac.)
Catchment Lag time =   0.152 hours
Unit interval =  15.000 minutes
Unit interval percentage of lag time = 164.4737
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.400(In/Hr)
Average low loss rate fraction (Yb) = 0.412 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of      10.00(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.612(In)
30-minute factor = 1.000    Adjusted rainfall =  1.047(In)
1-hour factor = 1.000       Adjusted rainfall =  1.289(In)
```

3-hour factor = 1.000 Adjusted rainfall = 2.160(In)
6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K =	40.31 (CFS))	
1	35.072	14.138
2	83.098	19.361
3	94.044	4.413
4	97.998	1.594
5	100.000	0.807

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8507	0.0974
2	1.0473	0.0557
3	1.1828	0.0411
4	1.2894	0.0332
5	1.4318	0.0456
6	1.5598	0.0413
7	1.6769	0.0380
8	1.7854	0.0353
9	1.8869	0.0331
10	1.9826	0.0313
11	2.0733	0.0297
12	2.1598	0.0284
13	2.2425	0.0272
14	2.3218	0.0261
15	2.3982	0.0252
16	2.4719	0.0243
17	2.5432	0.0235
18	2.6124	0.0228
19	2.6795	0.0222
20	2.7448	0.0216
21	2.8083	0.0210
22	2.8703	0.0205
23	2.9308	0.0200
24	2.9899	0.0196
25	3.0560	0.0219
26	3.1208	0.0215
27	3.1845	0.0211
28	3.2471	0.0208
29	3.3087	0.0204
30	3.3693	0.0201
31	3.4289	0.0198

32	3.4877	0.0195
33	3.5456	0.0192
34	3.6028	0.0190
35	3.6591	0.0187
36	3.7147	0.0185
37	3.7696	0.0182
38	3.8238	0.0180
39	3.8773	0.0178
40	3.9302	0.0176
41	3.9825	0.0174
42	4.0342	0.0172
43	4.0854	0.0170
44	4.1360	0.0168
45	4.1860	0.0166
46	4.2356	0.0165
47	4.2846	0.0163
48	4.3332	0.0161
49	4.3813	0.0160
50	4.4289	0.0158
51	4.4761	0.0157
52	4.5229	0.0155
53	4.5692	0.0154
54	4.6152	0.0153
55	4.6607	0.0151
56	4.7059	0.0150
57	4.7507	0.0149
58	4.7952	0.0148
59	4.8392	0.0147
60	4.8830	0.0145
61	4.9264	0.0144
62	4.9694	0.0143
63	5.0122	0.0142
64	5.0546	0.0141
65	5.0967	0.0140
66	5.1386	0.0139
67	5.1801	0.0138
68	5.2214	0.0137
69	5.2623	0.0136
70	5.3030	0.0135
71	5.3434	0.0134
72	5.3836	0.0134
73	5.4235	0.0133
74	5.4631	0.0132
75	5.5025	0.0131
76	5.5417	0.0130
77	5.5806	0.0129
78	5.6193	0.0129
79	5.6577	0.0128
80	5.6960	0.0127
81	5.7340	0.0126
82	5.7717	0.0126

83	5.8093	0.0125
84	5.8467	0.0124
85	5.8838	0.0124
86	5.9208	0.0123
87	5.9576	0.0122
88	5.9941	0.0122
89	6.0305	0.0121
90	6.0667	0.0120
91	6.1027	0.0120
92	6.1385	0.0119
93	6.1741	0.0119
94	6.2095	0.0118
95	6.2448	0.0117
96	6.2799	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0351	0.0145	0.0207
2	0.0354	0.0146	0.0208
3	0.0356	0.0147	0.0210
4	0.0359	0.0148	0.0211
5	0.0362	0.0149	0.0213
6	0.0365	0.0150	0.0215
7	0.0368	0.0151	0.0216
8	0.0371	0.0153	0.0218
9	0.0374	0.0154	0.0220
10	0.0377	0.0155	0.0222
11	0.0380	0.0157	0.0224
12	0.0384	0.0158	0.0226
13	0.0387	0.0159	0.0228
14	0.0390	0.0161	0.0230
15	0.0394	0.0162	0.0232
16	0.0398	0.0164	0.0234
17	0.0402	0.0165	0.0236
18	0.0406	0.0167	0.0239
19	0.0410	0.0169	0.0241
20	0.0414	0.0170	0.0244
21	0.0419	0.0172	0.0246
22	0.0423	0.0174	0.0249
23	0.0428	0.0176	0.0252
24	0.0433	0.0178	0.0254
25	0.0438	0.0180	0.0257
26	0.0443	0.0182	0.0260
27	0.0448	0.0185	0.0264
28	0.0454	0.0187	0.0267
29	0.0460	0.0189	0.0271
30	0.0466	0.0192	0.0274
31	0.0472	0.0195	0.0278
32	0.0479	0.0197	0.0282

33	0.0486	0.0200	0.0286
34	0.0493	0.0203	0.0290
35	0.0501	0.0206	0.0295
36	0.0509	0.0210	0.0299
37	0.0518	0.0213	0.0305
38	0.0526	0.0217	0.0310
39	0.0536	0.0221	0.0315
40	0.0546	0.0225	0.0321
41	0.0557	0.0229	0.0328
42	0.0568	0.0234	0.0334
43	0.0580	0.0239	0.0341
44	0.0593	0.0244	0.0349
45	0.0607	0.0250	0.0357
46	0.0621	0.0256	0.0366
47	0.0638	0.0263	0.0375
48	0.0655	0.0270	0.0385
49	0.0593	0.0244	0.0349
50	0.0613	0.0252	0.0361
51	0.0637	0.0263	0.0375
52	0.0663	0.0273	0.0390
53	0.0694	0.0286	0.0408
54	0.0726	0.0299	0.0427
55	0.0767	0.0316	0.0451
56	0.0812	0.0334	0.0477
57	0.0869	0.0358	0.0511
58	0.0934	0.0385	0.0550
59	0.1023	0.0421	0.0602
60	0.1131	0.0466	0.0665
61	0.1296	0.0533	0.0762
62	0.1160	0.0478	0.0683
63	0.1416	0.0583	0.0833
64	0.3031	0.1001	0.2030
65	0.7381	0.1001	0.6380
66	0.1314	0.0541	0.0773
67	0.1117	0.0460	0.0657
68	0.0925	0.0381	0.0544
69	0.0805	0.0332	0.0474
70	0.0722	0.0297	0.0425
71	0.0659	0.0271	0.0388
72	0.0610	0.0251	0.0359
73	0.0653	0.0269	0.0384
74	0.0619	0.0255	0.0364
75	0.0591	0.0243	0.0348
76	0.0566	0.0233	0.0333
77	0.0544	0.0224	0.0320
78	0.0525	0.0216	0.0309
79	0.0508	0.0209	0.0299
80	0.0492	0.0203	0.0289
81	0.0478	0.0197	0.0281
82	0.0465	0.0191	0.0274
83	0.0453	0.0187	0.0266

84	0.0442	0.0182	0.0260
85	0.0432	0.0178	0.0254
86	0.0422	0.0174	0.0248
87	0.0413	0.0170	0.0243
88	0.0405	0.0167	0.0238
89	0.0397	0.0164	0.0234
90	0.0390	0.0161	0.0229
91	0.0383	0.0158	0.0225
92	0.0376	0.0155	0.0221
93	0.0370	0.0152	0.0218
94	0.0364	0.0150	0.0214
95	0.0359	0.0148	0.0211
96	0.0353	0.0145	0.0208

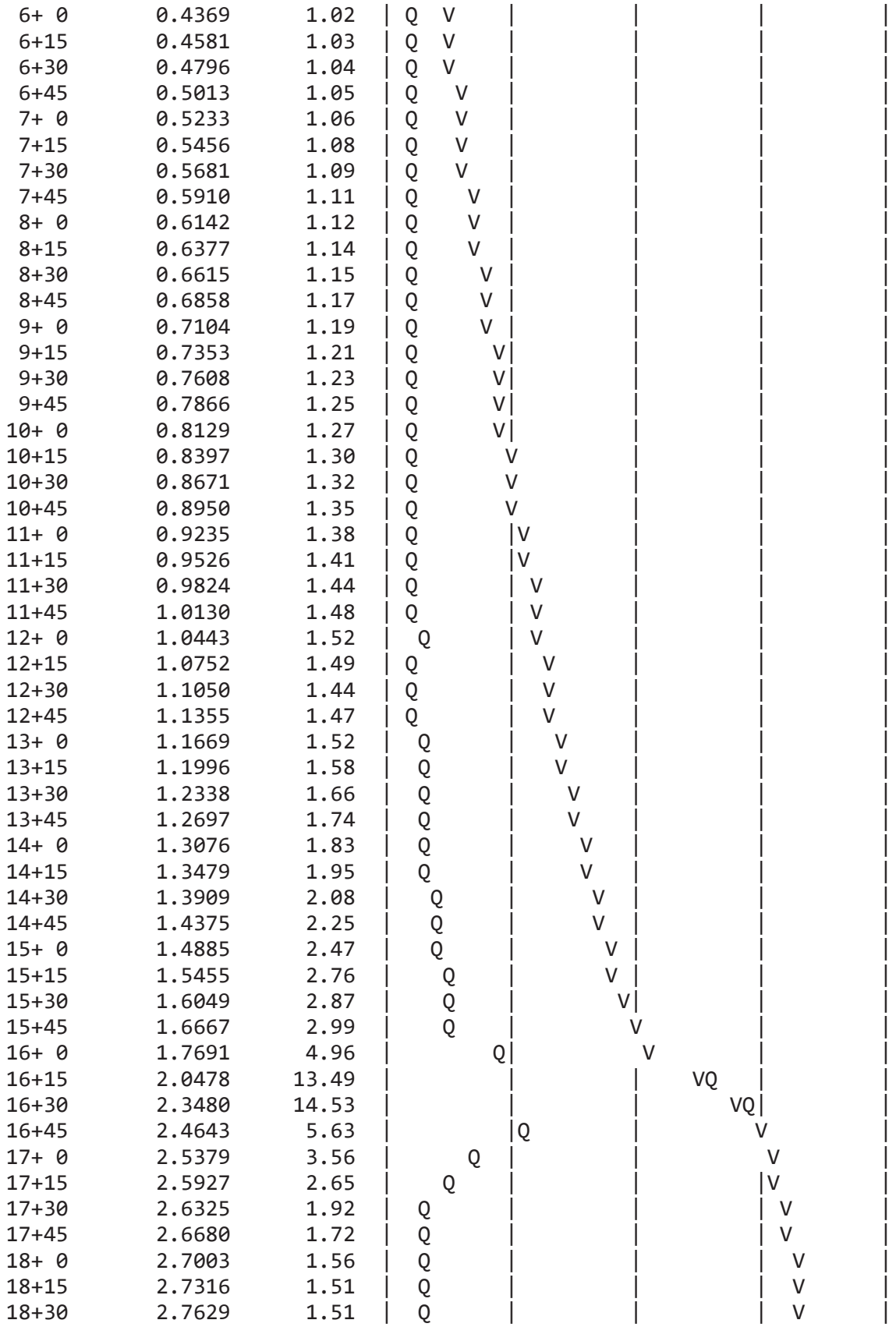
Total soil rain loss = 2.36(In)
Total effective rainfall = 3.92(In)
Peak flow rate in flood hydrograph = 14.53(CFS)

++

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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+15	0.0060	0.29	Q				
0+30	0.0204	0.69	VQ				
0+45	0.0367	0.79	VQ				
1+ 0	0.0538	0.83	VQ				
1+15	0.0715	0.85	VQ				
1+30	0.0892	0.86	Q				
1+45	0.1071	0.87	|Q				
2+ 0	0.1251	0.87	|Q				
2+15	0.1433	0.88	|Q				
2+30	0.1616	0.89	|Q				
2+45	0.1801	0.89	|QV				
3+ 0	0.1988	0.90	|QV				
3+15	0.2176	0.91	|QV				
3+30	0.2366	0.92	|QV				
3+45	0.2557	0.93	|Q V				
4+ 0	0.2751	0.94	|Q V				
4+15	0.2946	0.94	|Q V				
4+30	0.3143	0.95	|Q V				
4+45	0.3342	0.96	|Q V				
5+ 0	0.3543	0.97	|Q V				
5+15	0.3746	0.98	|Q V				
5+30	0.3951	0.99	|Q V				
5+45	0.4159	1.00	| Q V				



```
   18+45       2.7929      1.45  | Q       |         |         |   V     |
   19+ 0       2.8217      1.39  | Q       |         |         |   V     |
   19+15       2.8494      1.34  | Q       |         |         |   V     |
   19+30       2.8760      1.29  | Q       |         |         |    V    |
   19+45       2.9017      1.24  | Q       |         |         |    V    |
   20+ 0       2.9265      1.20  | Q       |         |         |    V    |
   20+15       2.9506      1.16  | Q       |         |         |     V   |
   20+30       2.9740      1.13  | Q       |         |         |     V   |
   20+45       2.9967      1.10  | Q       |         |         |     V   |
   21+ 0       3.0189      1.07  | Q       |         |         |     V   |
   21+15       3.0405      1.05  | Q       |         |         |      V  |
   21+30       3.0616      1.02  | Q       |         |         |      V  |
   21+45       3.0823      1.00  |Q        |         |         |      V  |
   22+ 0       3.1025      0.98  |Q        |         |         |      V  |
   22+15       3.1223      0.96  |Q        |         |         |       V |
   22+30       3.1417      0.94  |Q        |         |         |       V |
   22+45       3.1608      0.92  |Q        |         |         |       V |
   23+ 0       3.1795      0.91  |Q        |         |         |       V |
   23+15       3.1980      0.89  |Q        |         |         |        V|
   23+30       3.2161      0.88  |Q        |         |         |        V|
   23+45       3.2339      0.86  |Q        |         |         |        V|
   24+ 0       3.2515      0.85  |Q        |         |         |        V|
   24+15       3.2628      0.55  |Q        |         |         |        V|
   24+30       3.2657      0.14  Q         |         |         |        V|
-------------------------------------------------------------------------
```

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
POST-PROJECT CONDITION FOR AREA D1
HCCII, 11-04-2019

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 10		
2.45	1	0.77
Rainfall data for year 2		
2.45	6	1.08
Rainfall data for year 2		
2.45	24	2.03
Rainfall data for year 100		
2.45	1	1.29

```
------------------------------------------------------------------
Rainfall data for year 100
             2.45            6           2.99
------------------------------------------------------------------
Rainfall data for year 100
             2.45           24           6.28
------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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          2.45      1.000     0.785    0.210    0.165

Area-averaged adjusted loss rate Fm (In/Hr) =  0.165

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     0.51   0.210         32.0      52.0       9.23     0.229
     1.94   0.790         98.0      98.0       0.20     0.962

Area-averaged catchment yield fraction, Y =  0.808
Area-averaged low loss fraction, Yb =  0.192
User entry of time of concentration  =   0.190 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =       2.45(Ac.)
Catchment Lag time =   0.152 hours
Unit interval =  15.000 minutes
Unit interval percentage of lag time = 164.4737
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.165(In/Hr)
Average low loss rate fraction (Yb) = 0.192 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of       2.45(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.612(In)
30-minute factor = 1.000    Adjusted rainfall =  1.048(In)
1-hour factor = 1.000       Adjusted rainfall =  1.290(In)
```

3-hour factor = 1.000 Adjusted rainfall = 2.160(In)
6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 9.88 (CFS))		
1	35.072	3.464
2	83.098	4.743
3	94.044	1.081
4	97.998	0.390
5	100.000	0.198

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8510	0.0975
2	1.0477	0.0558
3	1.1832	0.0411
4	1.2899	0.0332
5	1.4322	0.0456
6	1.5602	0.0413
7	1.6772	0.0380
8	1.7857	0.0353
9	1.8871	0.0331
10	1.9828	0.0313
11	2.0735	0.0297
12	2.1599	0.0284
13	2.2425	0.0272
14	2.3219	0.0261
15	2.3983	0.0252
16	2.4720	0.0243
17	2.5433	0.0235
18	2.6125	0.0228
19	2.6796	0.0222
20	2.7448	0.0216
21	2.8084	0.0210
22	2.8704	0.0205
23	2.9309	0.0200
24	2.9900	0.0196
25	3.0560	0.0219
26	3.1209	0.0215
27	3.1846	0.0211
28	3.2472	0.0208
29	3.3087	0.0204
30	3.3693	0.0201
31	3.4290	0.0198

32	3.4878	0.0195
33	3.5457	0.0192
34	3.6028	0.0190
35	3.6592	0.0187
36	3.7148	0.0185
37	3.7697	0.0182
38	3.8239	0.0180
39	3.8774	0.0178
40	3.9303	0.0176
41	3.9826	0.0174
42	4.0343	0.0172
43	4.0854	0.0170
44	4.1360	0.0168
45	4.1861	0.0166
46	4.2356	0.0165
47	4.2847	0.0163
48	4.3332	0.0161
49	4.3813	0.0160
50	4.4290	0.0158
51	4.4762	0.0157
52	4.5229	0.0155
53	4.5693	0.0154
54	4.6153	0.0153
55	4.6608	0.0151
56	4.7060	0.0150
57	4.7508	0.0149
58	4.7952	0.0148
59	4.8393	0.0147
60	4.8830	0.0145
61	4.9264	0.0144
62	4.9695	0.0143
63	5.0123	0.0142
64	5.0547	0.0141
65	5.0968	0.0140
66	5.1386	0.0139
67	5.1802	0.0138
68	5.2214	0.0137
69	5.2624	0.0136
70	5.3031	0.0135
71	5.3435	0.0134
72	5.3837	0.0134
73	5.4236	0.0133
74	5.4632	0.0132
75	5.5026	0.0131
76	5.5417	0.0130
77	5.5807	0.0129
78	5.6193	0.0129
79	5.6578	0.0128
80	5.6960	0.0127
81	5.7340	0.0126
82	5.7718	0.0126

83	5.8094	0.0125
84	5.8467	0.0124
85	5.8839	0.0124
86	5.9209	0.0123
87	5.9576	0.0122
88	5.9942	0.0122
89	6.0305	0.0121
90	6.0667	0.0120
91	6.1027	0.0120
92	6.1385	0.0119
93	6.1742	0.0119
94	6.2096	0.0118
95	6.2449	0.0117
96	6.2800	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0351	0.0067	0.0284
2	0.0354	0.0068	0.0286
3	0.0356	0.0068	0.0288
4	0.0359	0.0069	0.0290
5	0.0362	0.0069	0.0293
6	0.0365	0.0070	0.0295
7	0.0368	0.0071	0.0297
8	0.0371	0.0071	0.0300
9	0.0374	0.0072	0.0302
10	0.0377	0.0072	0.0305
11	0.0380	0.0073	0.0307
12	0.0384	0.0074	0.0310
13	0.0387	0.0074	0.0313
14	0.0390	0.0075	0.0316
15	0.0394	0.0076	0.0319
16	0.0398	0.0076	0.0322
17	0.0402	0.0077	0.0325
18	0.0406	0.0078	0.0328
19	0.0410	0.0079	0.0331
20	0.0414	0.0079	0.0335
21	0.0419	0.0080	0.0338
22	0.0423	0.0081	0.0342
23	0.0428	0.0082	0.0346
24	0.0433	0.0083	0.0350
25	0.0438	0.0084	0.0354
26	0.0443	0.0085	0.0358
27	0.0448	0.0086	0.0362
28	0.0454	0.0087	0.0367
29	0.0460	0.0088	0.0372
30	0.0466	0.0089	0.0376
31	0.0472	0.0091	0.0382
32	0.0479	0.0092	0.0387

33	0.0486	0.0093	0.0393
34	0.0493	0.0095	0.0399
35	0.0501	0.0096	0.0405
36	0.0509	0.0098	0.0411
37	0.0518	0.0099	0.0418
38	0.0526	0.0101	0.0425
39	0.0536	0.0103	0.0433
40	0.0546	0.0105	0.0441
41	0.0557	0.0107	0.0450
42	0.0568	0.0109	0.0459
43	0.0580	0.0111	0.0469
44	0.0593	0.0114	0.0479
45	0.0607	0.0116	0.0491
46	0.0621	0.0119	0.0502
47	0.0638	0.0122	0.0516
48	0.0655	0.0126	0.0529
49	0.0593	0.0114	0.0479
50	0.0613	0.0118	0.0495
51	0.0637	0.0122	0.0515
52	0.0663	0.0127	0.0536
53	0.0694	0.0133	0.0561
54	0.0726	0.0139	0.0587
55	0.0767	0.0147	0.0620
56	0.0812	0.0156	0.0656
57	0.0869	0.0167	0.0702
58	0.0934	0.0179	0.0755
59	0.1022	0.0196	0.0826
60	0.1131	0.0217	0.0914
61	0.1295	0.0249	0.1047
62	0.1160	0.0223	0.0938
63	0.1417	0.0272	0.1145
64	0.3032	0.0412	0.2619
65	0.7383	0.0412	0.6971
66	0.1314	0.0252	0.1062
67	0.1116	0.0214	0.0902
68	0.0925	0.0177	0.0747
69	0.0805	0.0155	0.0651
70	0.0722	0.0138	0.0583
71	0.0659	0.0126	0.0533
72	0.0610	0.0117	0.0493
73	0.0653	0.0125	0.0527
74	0.0619	0.0119	0.0500
75	0.0591	0.0113	0.0477
76	0.0566	0.0109	0.0457
77	0.0544	0.0104	0.0440
78	0.0525	0.0101	0.0424
79	0.0508	0.0097	0.0410
80	0.0492	0.0094	0.0398
81	0.0478	0.0092	0.0386
82	0.0465	0.0089	0.0376
83	0.0453	0.0087	0.0366

84	0.0442	0.0085	0.0357
85	0.0432	0.0083	0.0349
86	0.0422	0.0081	0.0341
87	0.0413	0.0079	0.0334
88	0.0405	0.0078	0.0327
89	0.0397	0.0076	0.0321
90	0.0390	0.0075	0.0315
91	0.0383	0.0073	0.0310
92	0.0376	0.0072	0.0304
93	0.0370	0.0071	0.0299
94	0.0364	0.0070	0.0294
95	0.0359	0.0069	0.0290
96	0.0353	0.0068	0.0286

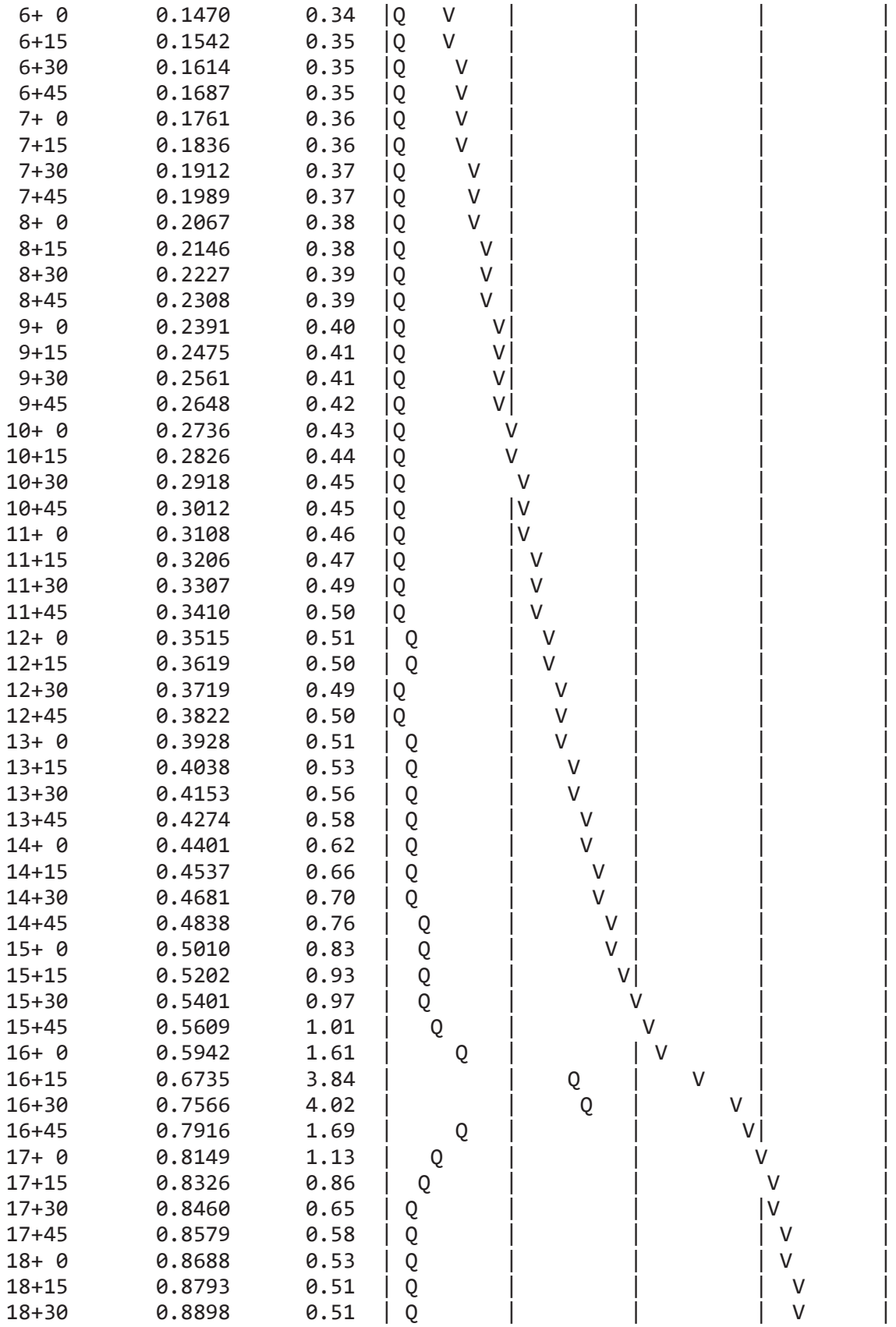
Total soil rain loss = 1.09(In)
Total effective rainfall = 5.19(In)
Peak flow rate in flood hydrograph = 4.02(CFS)

++

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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+15	0.0020	0.10	Q	|	|	|	|
0+30	0.0069	0.23	Q	|	|	|	|
0+45	0.0124	0.27	VQ	|	|	|	|
1+ 0	0.0181	0.28	VQ	|	|	|	|
1+15	0.0241	0.29	VQ	|	|	|	|
1+30	0.0300	0.29	Q	|	|	|	|
1+45	0.0360	0.29	|Q	|	|	|	|
2+ 0	0.0421	0.29	|Q	|	|	|	|
2+15	0.0482	0.30	|Q	|	|	|	|
2+30	0.0544	0.30	|QV	|	|	|	|
2+45	0.0606	0.30	|QV	|	|	|	|
3+ 0	0.0669	0.30	|QV	|	|	|	|
3+15	0.0732	0.31	|QV	|	|	|	|
3+30	0.0796	0.31	|Q V	|	|	|	|
3+45	0.0861	0.31	|Q V	|	|	|	|
4+ 0	0.0926	0.31	|Q V	|	|	|	|
4+15	0.0991	0.32	|Q V	|	|	|	|
4+30	0.1058	0.32	|Q V	|	|	|	|
4+45	0.1125	0.32	|Q V	|	|	|	|
5+ 0	0.1192	0.33	|Q V	|	|	|	|
5+15	0.1261	0.33	|Q V	|	|	|	|
5+30	0.1330	0.33	|Q V	|	|	|	|
5+45	0.1400	0.34	|Q V	|	|	|	|



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   18+45       0.9000      0.49  |Q        |         |         |  V      |
   19+ 0       0.9097      0.47  |Q        |         |         |   V     |
   19+15       0.9190      0.45  |Q        |         |         |   V     |
   19+30       0.9279      0.43  |Q        |         |         |    V    |
   19+45       0.9366      0.42  |Q        |         |         |    V    |
   20+ 0       0.9449      0.40  |Q        |         |         |    V    |
   20+15       0.9530      0.39  |Q        |         |         |    V    |
   20+30       0.9609      0.38  |Q        |         |         |     V   |
   20+45       0.9685      0.37  |Q        |         |         |     V   |
   21+ 0       0.9760      0.36  |Q        |         |         |     V   |
   21+15       0.9833      0.35  |Q        |         |         |      V  |
   21+30       0.9904      0.34  |Q        |         |         |      V  |
   21+45       0.9973      0.34  |Q        |         |         |      V  |
   22+ 0       1.0041      0.33  |Q        |         |         |      V  |
   22+15       1.0108      0.32  |Q        |         |         |       V |
   22+30       1.0174      0.32  |Q        |         |         |       V |
   22+45       1.0238      0.31  |Q        |         |         |       V |
   23+ 0       1.0301      0.31  |Q        |         |         |       V |
   23+15       1.0363      0.30  |Q        |         |         |        V|
   23+30       1.0424      0.30  |Q        |         |         |        V|
   23+45       1.0484      0.29  |Q        |         |         |        V|
   24+ 0       1.0543      0.29  |Q        |         |         |        V|
   24+15       1.0581      0.18  Q         |         |         |        V|
   24+30       1.0591      0.05  Q         |         |         |        V|
-------------------------------------------------------------------------
```

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
POST-PROJECT CONDITION FOR AREA A
HCCII, 11-04-2019

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 10		
53.16	1	0.77
Rainfall data for year 2		
53.16	6	1.08
Rainfall data for year 2		
53.16	24	2.03
Rainfall data for year 100		
53.16	1	1.29

```
------------------------------------------------------------------
Rainfall data for year 100
           53.16            6           2.99
------------------------------------------------------------------
Rainfall data for year 100
           53.16           24           6.28
------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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         53.16      1.000     0.785    0.150    0.118

Area-averaged adjusted loss rate Fm (In/Hr) =  0.118

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     7.97   0.150         32.0      52.0       9.23     0.229
    45.19   0.850         98.0      98.0       0.20     0.962

Area-averaged catchment yield fraction, Y =  0.852
Area-averaged low loss fraction, Yb =  0.148
User entry of time of concentration  =   0.350 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      53.16(Ac.)
Catchment Lag time =   0.280 hours
Unit interval =  15.000 minutes
Unit interval percentage of lag time = 89.2857
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.118(In/Hr)
Average low loss rate fraction (Yb) = 0.148 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of      53.16(Ac.) (Ref: fig. E-4)

5-minute factor = 0.998     Adjusted rainfall =  0.611(In)
30-minute factor = 0.998    Adjusted rainfall =  1.045(In)
1-hour factor = 0.998       Adjusted rainfall =  1.287(In)
```

3-hour factor = 1.000 Adjusted rainfall = 2.159(In)
6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 214.30 (CFS))	
1	13.717	29.397
2	62.461	104.458
3	81.000	39.729
4	89.304	17.796
5	93.851	9.743
6	96.610	5.913
7	98.101	3.196
8	99.129	2.202
9	100.000	1.866

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8490	0.0972
2	1.0452	0.0556
3	1.1804	0.0410
4	1.2868	0.0332
5	1.4294	0.0457
6	1.5577	0.0414
7	1.6750	0.0381
8	1.7838	0.0354
9	1.8855	0.0332
10	1.9815	0.0314
11	2.0725	0.0298
12	2.1592	0.0285
13	2.2419	0.0272
14	2.3213	0.0261
15	2.3977	0.0252
16	2.4714	0.0243
17	2.5427	0.0235
18	2.6119	0.0228
19	2.6790	0.0222
20	2.7443	0.0216
21	2.8079	0.0210
22	2.8699	0.0205
23	2.9304	0.0200
24	2.9895	0.0196
25	3.0556	0.0219
26	3.1204	0.0215
27	3.1841	0.0211

28	3.2467	0.0208
29	3.3083	0.0204
30	3.3689	0.0201
31	3.4285	0.0198
32	3.4873	0.0195
33	3.5452	0.0192
34	3.6023	0.0190
35	3.6587	0.0187
36	3.7143	0.0185
37	3.7692	0.0182
38	3.8234	0.0180
39	3.8769	0.0178
40	3.9298	0.0176
41	3.9821	0.0174
42	4.0338	0.0172
43	4.0850	0.0170
44	4.1356	0.0168
45	4.1856	0.0166
46	4.2352	0.0165
47	4.2842	0.0163
48	4.3328	0.0161
49	4.3809	0.0160
50	4.4285	0.0158
51	4.4757	0.0157
52	4.5225	0.0155
53	4.5688	0.0154
54	4.6148	0.0153
55	4.6603	0.0151
56	4.7055	0.0150
57	4.7503	0.0149
58	4.7948	0.0148
59	4.8388	0.0147
60	4.8826	0.0145
61	4.9260	0.0144
62	4.9690	0.0143
63	5.0118	0.0142
64	5.0542	0.0141
65	5.0964	0.0140
66	5.1382	0.0139
67	5.1797	0.0138
68	5.2210	0.0137
69	5.2619	0.0136
70	5.3026	0.0135
71	5.3430	0.0134
72	5.3832	0.0134
73	5.4231	0.0133
74	5.4628	0.0132
75	5.5022	0.0131
76	5.5413	0.0130
77	5.5802	0.0129
78	5.6189	0.0129

79	5.6574	0.0128
80	5.6956	0.0127
81	5.7336	0.0126
82	5.7714	0.0126
83	5.8090	0.0125
84	5.8463	0.0124
85	5.8835	0.0124
86	5.9204	0.0123
87	5.9572	0.0122
88	5.9938	0.0122
89	6.0301	0.0121
90	6.0663	0.0120
91	6.1023	0.0120
92	6.1381	0.0119
93	6.1737	0.0119
94	6.2092	0.0118
95	6.2445	0.0117
96	6.2796	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0351	0.0052	0.0299
2	0.0354	0.0052	0.0301
3	0.0357	0.0053	0.0304
4	0.0359	0.0053	0.0306
5	0.0362	0.0054	0.0308
6	0.0365	0.0054	0.0311
7	0.0368	0.0054	0.0313
8	0.0371	0.0055	0.0316
9	0.0374	0.0055	0.0319
10	0.0377	0.0056	0.0321
11	0.0380	0.0056	0.0324
12	0.0384	0.0057	0.0327
13	0.0387	0.0057	0.0330
14	0.0390	0.0058	0.0333
15	0.0394	0.0058	0.0336
16	0.0398	0.0059	0.0339
17	0.0402	0.0059	0.0342
18	0.0406	0.0060	0.0346
19	0.0410	0.0061	0.0349
20	0.0414	0.0061	0.0353
21	0.0419	0.0062	0.0357
22	0.0423	0.0063	0.0360
23	0.0428	0.0063	0.0365
24	0.0433	0.0064	0.0369
25	0.0438	0.0065	0.0373
26	0.0443	0.0065	0.0377
27	0.0448	0.0066	0.0382
28	0.0454	0.0067	0.0387

29	0.0460	0.0068	0.0392
30	0.0466	0.0069	0.0397
31	0.0472	0.0070	0.0403
32	0.0479	0.0071	0.0408
33	0.0486	0.0072	0.0414
34	0.0493	0.0073	0.0420
35	0.0501	0.0074	0.0427
36	0.0509	0.0075	0.0434
37	0.0518	0.0077	0.0441
38	0.0526	0.0078	0.0448
39	0.0536	0.0079	0.0457
40	0.0546	0.0081	0.0465
41	0.0557	0.0082	0.0474
42	0.0568	0.0084	0.0484
43	0.0580	0.0086	0.0494
44	0.0593	0.0088	0.0505
45	0.0607	0.0090	0.0517
46	0.0621	0.0092	0.0530
47	0.0638	0.0094	0.0544
48	0.0655	0.0097	0.0558
49	0.0593	0.0088	0.0505
50	0.0613	0.0091	0.0523
51	0.0638	0.0094	0.0543
52	0.0663	0.0098	0.0565
53	0.0694	0.0103	0.0591
54	0.0727	0.0107	0.0619
55	0.0767	0.0113	0.0654
56	0.0812	0.0120	0.0692
57	0.0872	0.0129	0.0743
58	0.0937	0.0139	0.0798
59	0.1026	0.0152	0.0874
60	0.1134	0.0168	0.0966
61	0.1298	0.0192	0.1106
62	0.1160	0.0172	0.0988
63	0.1414	0.0209	0.1204
64	0.3024	0.0294	0.2730
65	0.7366	0.0294	0.7071
66	0.1315	0.0194	0.1120
67	0.1119	0.0166	0.0954
68	0.0928	0.0137	0.0791
69	0.0805	0.0119	0.0686
70	0.0722	0.0107	0.0615
71	0.0659	0.0098	0.0562
72	0.0610	0.0090	0.0520
73	0.0653	0.0097	0.0556
74	0.0619	0.0092	0.0528
75	0.0591	0.0087	0.0503
76	0.0566	0.0084	0.0482
77	0.0544	0.0081	0.0464
78	0.0525	0.0078	0.0447
79	0.0508	0.0075	0.0433

80	0.0492	0.0073	0.0419
81	0.0478	0.0071	0.0407
82	0.0465	0.0069	0.0396
83	0.0453	0.0067	0.0386
84	0.0442	0.0065	0.0377
85	0.0432	0.0064	0.0368
86	0.0422	0.0062	0.0360
87	0.0413	0.0061	0.0352
88	0.0405	0.0060	0.0345
89	0.0397	0.0059	0.0339
90	0.0390	0.0058	0.0332
91	0.0383	0.0057	0.0326
92	0.0376	0.0056	0.0321
93	0.0370	0.0055	0.0315
94	0.0364	0.0054	0.0310
95	0.0359	0.0053	0.0306
96	0.0353	0.0052	0.0301

Total soil rain loss = 0.83(In)
Total effective rainfall = 5.45(In)
Peak flow rate in flood hydrograph = 92.42(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	25.0	50.0	75.0	100.0
0+15	0.0182	0.88	Q				
0+30	0.1011	4.01	VQ				
0+45	0.2092	5.23	V Q				
1+ 0	0.3290	5.80	V Q				
1+15	0.4559	6.14	V Q				
1+30	0.5873	6.36	V Q				
1+45	0.7218	6.51	|VQ				
2+ 0	0.8587	6.63	|VQ				
2+15	0.9979	6.74	|VQ				
2+30	1.1382	6.79	|VQ				
2+45	1.2796	6.85	| Q				
3+ 0	1.4223	6.91	| Q				
3+15	1.5662	6.97	| Q				
3+30	1.7114	7.03	| Q				
3+45	1.8580	7.09	| QV				
4+ 0	2.0058	7.16	| QV				
4+15	2.1551	7.22	| QV				
4+30	2.3057	7.29	| QV				
4+45	2.4579	7.36	| Q V				

5+ 0	2.6116	7.44	Q V				
5+15	2.7668	7.51	QV				
5+30	2.9237	7.59	QV				
5+45	3.0822	7.67	Q V				
6+ 0	3.2425	7.76	Q V				
6+15	3.4046	7.84	Q V				
6+30	3.5685	7.93	Q V				
6+45	3.7344	8.03	Q V				
7+ 0	3.9022	8.13	Q V				
7+15	4.0722	8.23	Q V				
7+30	4.2443	8.33	Q V				
7+45	4.4187	8.44	Q V				
8+ 0	4.5954	8.55	Q V				
8+15	4.7746	8.67	Q V				
8+30	4.9564	8.80	Q V				
8+45	5.1408	8.93	Q V				
9+ 0	5.3280	9.06	Q V				
9+15	5.5182	9.21	Q V				
9+30	5.7116	9.36	Q V				
9+45	5.9081	9.51	Q V				
10+ 0	6.1082	9.68	Q V				
10+15	6.3119	9.86	Q V				
10+30	6.5195	10.05	Q V				
10+45	6.7312	10.25	Q V				
11+ 0	6.9473	10.46	Q V				
11+15	7.1681	10.69	Q V				
11+30	7.3939	10.93	Q V				
11+45	7.6251	11.19	Q V				
12+ 0	7.8622	11.48	Q V				
12+15	8.1013	11.57	Q V				
12+30	8.3323	11.18	Q V				
12+45	8.5651	11.27	Q V				
13+ 0	8.8038	11.55	Q V				
13+15	9.0505	11.94	Q V				
13+30	9.3069	12.41	Q V				
13+45	9.5748	12.97	Q V				
14+ 0	9.8564	13.63	Q V				
14+15	10.1540	14.40	Q V				
14+30	10.4715	15.37	Q V				
14+45	10.8127	16.51	Q V				
15+ 0	11.1837	17.96	Q V				
15+15	11.5933	19.82	Q V				
15+30	12.0385	21.55	Q V				
15+45	12.4892	21.81	Q V				
16+ 0	13.0782	28.51	Q V				
16+15	14.2784	58.09	Q				
16+30	16.1879	92.42	V	Q			
16+45	17.2198	49.95	Q V				
17+ 0	17.9107	33.44	Q V				
17+15	18.4349	25.37	Q V				
17+30	18.8566	20.41	Q V				

```
   17+45      19.2055     16.89  |     Q   |         |         |V        |
   18+ 0      19.5117     14.82  |    Q    |         |         | V       |
   18+15      19.7886     13.40  |    Q    |         |         | V       |
   18+30      20.0386     12.10  |   Q     |         |         |  V      |
   18+45      20.2785     11.61  |   Q     |         |         |  V      |
   19+ 0      20.5077     11.10  |   Q     |         |         |   V     |
   19+15      20.7274     10.63  |   Q     |         |         |   V     |
   19+30      20.9386     10.22  |   Q     |         |         |   V     |
   19+45      21.1420      9.85  |  Q      |         |         |    V    |
   20+ 0      21.3385      9.51  |  Q      |         |         |    V    |
   20+15      21.5288      9.21  |  Q      |         |         |    V    |
   20+30      21.7133      8.93  |  Q      |         |         |     V   |
   20+45      21.8925      8.67  |  Q      |         |         |     V   |
   21+ 0      22.0668      8.44  |  Q      |         |         |     V   |
   21+15      22.2367      8.22  |  Q      |         |         |     V   |
   21+30      22.4025      8.02  |  Q      |         |         |      V  |
   21+45      22.5645      7.84  |  Q      |         |         |      V  |
   22+ 0      22.7230      7.67  |  Q      |         |         |      V  |
   22+15      22.8781      7.51  |  Q      |         |         |      V  |
   22+30      23.0302      7.36  | Q       |         |         |       V |
   22+45      23.1793      7.22  | Q       |         |         |       V |
   23+ 0      23.3257      7.09  | Q       |         |         |       V |
   23+15      23.4695      6.96  | Q       |         |         |       V |
   23+30      23.6109      6.84  | Q       |         |         |        V|
   23+45      23.7500      6.73  | Q       |         |         |        V|
   24+ 0      23.8868      6.62  | Q       |         |         |        V|
   24+15      24.0035      5.65  | Q       |         |         |        V|
   24+30      24.0545      2.47  Q         |         |         |        V|
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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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
POST-PROJECT CONDITION FOR AREA B
HCCII, 11-04-2019

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 10		
71.42	1	0.77
Rainfall data for year 2		
71.42	6	1.08
Rainfall data for year 2		
71.42	24	2.03
Rainfall data for year 100		
71.42	1	1.29

```
------------------------------------------------------------------------
Rainfall data for year 100
           71.42            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
           71.42           24           6.28
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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         71.42      1.000     0.785    0.040    0.031

Area-averaged adjusted loss rate Fm (In/Hr) =  0.031

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     2.86   0.040         32.0      52.0       9.23     0.229
    68.56   0.960         98.0      98.0       0.20     0.962

Area-averaged catchment yield fraction, Y =  0.933
Area-averaged low loss fraction, Yb =  0.067
User entry of time of concentration  =   0.250 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      71.42(Ac.)
Catchment Lag time =   0.200 hours
Unit interval =  15.000 minutes
Unit interval percentage of lag time = 125.0000
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.031(In/Hr)
Average low loss rate fraction (Yb) = 0.067 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of      71.42(Ac.) (Ref: fig. E-4)

5-minute factor = 0.997     Adjusted rainfall =  0.610(In)
30-minute factor = 0.997    Adjusted rainfall =  1.044(In)
1-hour factor = 0.997       Adjusted rainfall =  1.286(In)
```

3-hour factor = 1.000 Adjusted rainfall = 2.159(In)
6-hour factor = 1.000 Adjusted rainfall = 2.989(In)
24-hour factor = 1.000 Adjusted rainfall = 6.279(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 287.91 (CFS))		
1	25.005	71.992
2	75.100	144.229
3	89.150	40.452
4	95.070	17.044
5	97.850	8.004
6	99.293	4.153
7	100.000	2.037

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.8482	0.0972
2	1.0443	0.0556
3	1.1794	0.0409
4	1.2857	0.0331
5	1.4284	0.0458
6	1.5567	0.0414
7	1.6742	0.0381
8	1.7831	0.0354
9	1.8850	0.0333
10	1.9810	0.0314
11	2.0722	0.0299
12	2.1590	0.0285
13	2.2417	0.0272
14	2.3210	0.0261
15	2.3974	0.0252
16	2.4712	0.0243
17	2.5425	0.0235
18	2.6117	0.0228
19	2.6788	0.0222
20	2.7441	0.0216
21	2.8077	0.0210
22	2.8697	0.0205
23	2.9302	0.0200
24	2.9893	0.0196
25	3.0554	0.0219
26	3.1202	0.0215
27	3.1839	0.0211
28	3.2465	0.0208
29	3.3081	0.0204

30	3.3687	0.0201
31	3.4283	0.0198
32	3.4871	0.0195
33	3.5450	0.0192
34	3.6022	0.0190
35	3.6585	0.0187
36	3.7141	0.0185
37	3.7690	0.0182
38	3.8232	0.0180
39	3.8767	0.0178
40	3.9296	0.0176
41	3.9819	0.0174
42	4.0337	0.0172
43	4.0848	0.0170
44	4.1354	0.0168
45	4.1854	0.0166
46	4.2350	0.0165
47	4.2840	0.0163
48	4.3326	0.0161
49	4.3807	0.0160
50	4.4283	0.0158
51	4.4755	0.0157
52	4.5223	0.0155
53	4.5687	0.0154
54	4.6146	0.0153
55	4.6602	0.0151
56	4.7053	0.0150
57	4.7501	0.0149
58	4.7946	0.0148
59	4.8387	0.0147
60	4.8824	0.0145
61	4.9258	0.0144
62	4.9689	0.0143
63	5.0116	0.0142
64	5.0541	0.0141
65	5.0962	0.0140
66	5.1380	0.0139
67	5.1796	0.0138
68	5.2208	0.0137
69	5.2618	0.0136
70	5.3025	0.0135
71	5.3429	0.0134
72	5.3830	0.0134
73	5.4229	0.0133
74	5.4626	0.0132
75	5.5020	0.0131
76	5.5411	0.0130
77	5.5801	0.0129
78	5.6188	0.0129
79	5.6572	0.0128
80	5.6954	0.0127

81	5.7334	0.0126	
82	5.7712	0.0126	
83	5.8088	0.0125	
84	5.8462	0.0124	
85	5.8833	0.0124	
86	5.9203	0.0123	
87	5.9570	0.0122	
88	5.9936	0.0122	
89	6.0300	0.0121	
90	6.0662	0.0120	
91	6.1022	0.0120	
92	6.1380	0.0119	
93	6.1736	0.0119	
94	6.2091	0.0118	
95	6.2443	0.0117	
96	6.2794	0.0117	

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0351	0.0024	0.0328
2	0.0354	0.0024	0.0330
3	0.0357	0.0024	0.0333
4	0.0359	0.0024	0.0335
5	0.0362	0.0024	0.0338
6	0.0365	0.0025	0.0340
7	0.0368	0.0025	0.0343
8	0.0371	0.0025	0.0346
9	0.0374	0.0025	0.0349
10	0.0377	0.0025	0.0352
11	0.0380	0.0026	0.0355
12	0.0384	0.0026	0.0358
13	0.0387	0.0026	0.0361
14	0.0391	0.0026	0.0364
15	0.0394	0.0027	0.0368
16	0.0398	0.0027	0.0371
17	0.0402	0.0027	0.0375
18	0.0406	0.0027	0.0378
19	0.0410	0.0028	0.0382
20	0.0414	0.0028	0.0386
21	0.0419	0.0028	0.0390
22	0.0423	0.0028	0.0395
23	0.0428	0.0029	0.0399
24	0.0433	0.0029	0.0403
25	0.0438	0.0029	0.0408
26	0.0443	0.0030	0.0413
27	0.0448	0.0030	0.0418
28	0.0454	0.0031	0.0423
29	0.0460	0.0031	0.0429
30	0.0466	0.0031	0.0435

31	0.0472	0.0032	0.0441
32	0.0479	0.0032	0.0447
33	0.0486	0.0033	0.0453
34	0.0493	0.0033	0.0460
35	0.0501	0.0034	0.0467
36	0.0509	0.0034	0.0475
37	0.0518	0.0035	0.0483
38	0.0526	0.0035	0.0491
39	0.0536	0.0036	0.0500
40	0.0546	0.0037	0.0509
41	0.0557	0.0037	0.0519
42	0.0568	0.0038	0.0530
43	0.0580	0.0039	0.0541
44	0.0593	0.0040	0.0553
45	0.0607	0.0041	0.0566
46	0.0621	0.0042	0.0580
47	0.0638	0.0043	0.0595
48	0.0655	0.0044	0.0611
49	0.0593	0.0040	0.0553
50	0.0613	0.0041	0.0572
51	0.0638	0.0043	0.0595
52	0.0663	0.0045	0.0618
53	0.0694	0.0047	0.0647
54	0.0727	0.0049	0.0678
55	0.0767	0.0052	0.0716
56	0.0812	0.0055	0.0757
57	0.0873	0.0059	0.0814
58	0.0938	0.0063	0.0875
59	0.1027	0.0069	0.0958
60	0.1135	0.0076	0.1059
61	0.1299	0.0079	0.1221
62	0.1159	0.0078	0.1081
63	0.1412	0.0079	0.1334
64	0.3022	0.0079	0.2943
65	0.7360	0.0079	0.7281
66	0.1315	0.0079	0.1237
67	0.1121	0.0075	0.1045
68	0.0929	0.0063	0.0867
69	0.0805	0.0054	0.0751
70	0.0722	0.0049	0.0673
71	0.0659	0.0044	0.0615
72	0.0610	0.0041	0.0569
73	0.0653	0.0044	0.0609
74	0.0619	0.0042	0.0578
75	0.0591	0.0040	0.0551
76	0.0566	0.0038	0.0528
77	0.0544	0.0037	0.0508
78	0.0525	0.0035	0.0490
79	0.0508	0.0034	0.0474
80	0.0492	0.0033	0.0459
81	0.0478	0.0032	0.0446

82	0.0465	0.0031	0.0434
83	0.0453	0.0030	0.0423
84	0.0442	0.0030	0.0412
85	0.0432	0.0029	0.0403
86	0.0422	0.0028	0.0394
87	0.0413	0.0028	0.0386
88	0.0405	0.0027	0.0378
89	0.0397	0.0027	0.0371
90	0.0390	0.0026	0.0364
91	0.0383	0.0026	0.0357
92	0.0376	0.0025	0.0351
93	0.0370	0.0025	0.0345
94	0.0364	0.0025	0.0340
95	0.0359	0.0024	0.0335
96	0.0353	0.0024	0.0330

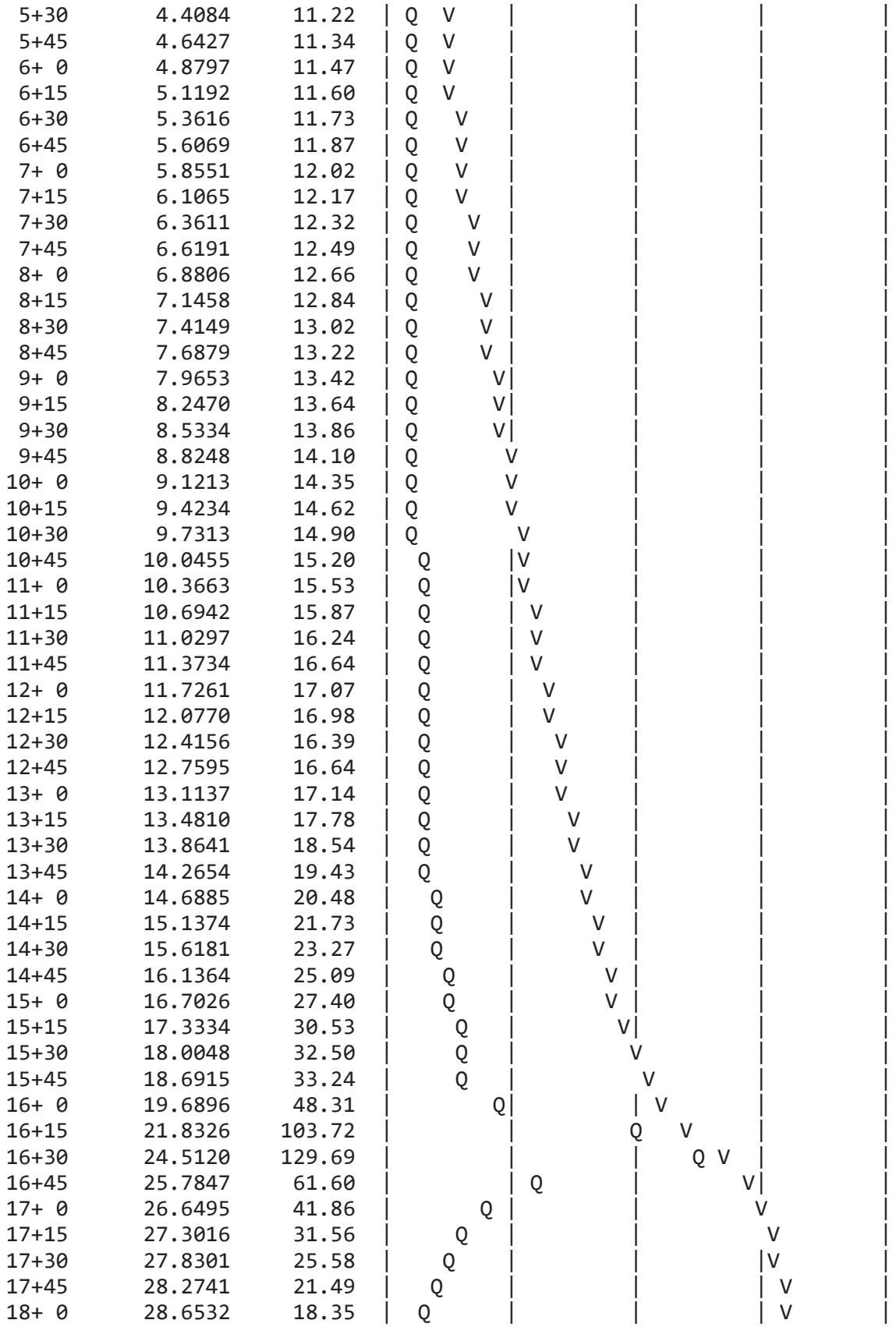
Total soil rain loss = 0.36(In)
Total effective rainfall = 5.91(In)
Peak flow rate in flood hydrograph = 129.69(CFS)

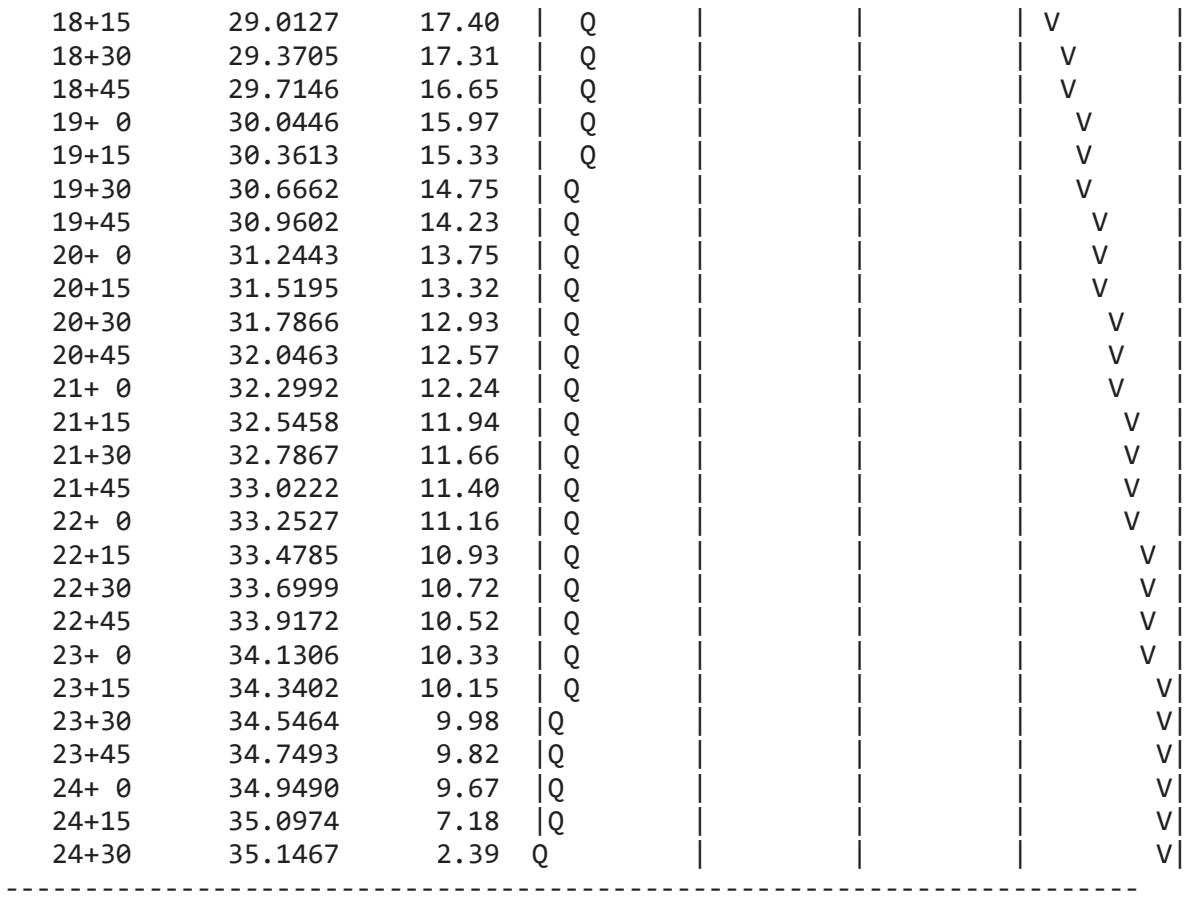
++

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 15 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+15	0.0487	2.36	Q	|	|	|	|
0+30	0.1954	7.10	VQ	|	|	|	|
0+45	0.3706	8.48	VQ	|	|	|	|
1+ 0	0.5586	9.10	VQ	|	|	|	|
1+15	0.7535	9.43	VQ	|	|	|	|
1+30	0.9527	9.64	Q	|	|	|	|
1+45	1.1549	9.78	|Q	|	|	|	|
2+ 0	1.3586	9.86	|Q	|	|	|	|
2+15	1.5640	9.94	|Q	|	|	|	|
2+30	1.7712	10.03	| Q	|	|	|	|
2+45	1.9800	10.11	| Q	|	|	|	|
3+ 0	2.1907	10.20	| Q	|	|	|	|
3+15	2.4032	10.29	| Q	|	|	|	|
3+30	2.6176	10.38	| Q	|	|	|	|
3+45	2.8340	10.47	| QV	|	|	|	|
4+ 0	3.0524	10.57	| QV	|	|	|	|
4+15	3.2728	10.67	| QV	|	|	|	|
4+30	3.4954	10.77	| QV	|	|	|	|
4+45	3.7202	10.88	| Q V	|	|	|	|
5+ 0	3.9472	10.99	| Q V	|	|	|	|
5+15	4.1766	11.10	| Q V	|	|	|	|




18+15 29.0127 17.40
18+30 29.3705 17.31
18+45 29.7146 16.65
19+ 0 30.0446 15.97
19+15 30.3613 15.33
19+30 30.6662 14.75
19+45 30.9602 14.23
20+ 0 31.2443 13.75
20+15 31.5195 13.32
20+30 31.7866 12.93
20+45 32.0463 12.57
21+ 0 32.2992 12.24
21+15 32.5458 11.94
21+30 32.7867 11.66
21+45 33.0222 11.40
22+ 0 33.2527 11.16
22+15 33.4785 10.93
22+30 33.6999 10.72
22+45 33.9172 10.52
23+ 0 34.1306 10.33
23+15 34.3402 10.15
23+30 34.5464 9.98
23+45 34.7493 9.82
24+ 0 34.9490 9.67
24+15 35.0974 7.18
24+30 35.1467 2.39

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: 10/25/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM- AREA B
PRE-DEVELOPED CONDITION

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 2.100 to Point/Station 2.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 328.190(Ft.)
Top (of initial area) elevation = 3597.780(Ft.)
Bottom (of initial area) elevation = 3563.100(Ft.)
Difference in elevation = 34.680(Ft.)
Slope = 0.10567 s(%)= 10.57
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.353 min.
Rainfall intensity = 1.781(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.476
Subarea runoff = 6.371(CFS)
Total initial stream area = 7.520(Ac.)

Pervious area fraction = 1.000
Initial area Fm value = 0.840(In/Hr)
End of computations, Total Study Area = 7.52 (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 = 67.0

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: 10/25/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM- AREA A
PRE-DEVELOPED CONDITION

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 1.100 to Point/Station 1.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 29.500(Ft.)
Top (of initial area) elevation = 3602.010(Ft.)
Bottom (of initial area) elevation = 3583.280(Ft.)
Difference in elevation = 18.730(Ft.)
Slope = 0.63492 s(%)= 63.49
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 2.226 min.
Rainfall intensity = 4.495(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.732
Subarea runoff = 2.007(CFS)
Total initial stream area = 0.610(Ac.)

Pervious area fraction = 1.000
Initial area Fm value = 0.840(In/Hr)
End of computations, Total Study Area = 0.61 (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 = 67.0

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: 10/29/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM - AREA C
PRE-DEVELOPED CONDITION

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 3.100 to Point/Station 3.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 507.480(Ft.)
Top (of initial area) elevation = 3603.260(Ft.)
Bottom (of initial area) elevation = 3593.310(Ft.)
Difference in elevation = 9.950(Ft.)
Slope = 0.01961 s(%)= 1.96
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.927 min.
Rainfall intensity = 1.245(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.293
Subarea runoff = 3.251(CFS)
Total initial stream area = 8.910(Ac.)

```
      Pervious area fraction = 1.000
      Initial area Fm value =    0.840(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        3.200 to Point/Station
3.300
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.118(Ft.), Average velocity =   0.930(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.32
            2             50.00              0.15
            3            100.00              0.12
            4            150.00              0.00
            5            200.00              0.53
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      3.286(CFS)
        '     '    flow top width =     60.114(Ft.)
        '     '    velocity=    0.930(Ft/s)
        '     '    area =      3.535(Sq.Ft)
        '     '    Froude number =     0.676

      Upstream point elevation =  3593.310(Ft.)
      Downstream point elevation =  3570.490(Ft.)
      Flow length =  1481.380(Ft.)
      Travel time  =   26.56 min.
      Time of concentration =   40.49 min.
      Depth of flow =   0.118(Ft.)
      Average velocity =   0.930(Ft/s)
      Total irregular channel flow =     3.286(CFS)
      Irregular channel normal depth above invert elev. =   0.118(Ft.)
      Average velocity of channel(s) =   0.930(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      3.251(CFS) is being
used
      Rainfall intensity =      0.590(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   48.060(Ac.)
      Total runoff =      3.251(CFS)
      Effective area this stream =       56.97(Ac.)
```

```
      Total Study Area (Main Stream No. 1) =       56.97(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.117(Ft.), Average velocity =   0.927(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        3.200 to Point/Station
3.300
      **** SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
____
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      3.251(CFS) is being
used
      Time of concentration =    40.49 min.
      Rainfall intensity =      0.590(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   48.060(Ac.)
      Total runoff =      3.251(CFS)
      Effective area this stream =      105.03(Ac.)
      Total Study Area (Main Stream No. 1) =      105.03(Ac.)
      Area averaged Fm value =    0.840(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        3.300 to Point/Station
3.400
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.130(Ft.), Average velocity =   1.038(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.30
            2             50.00              0.24
            3            100.00              0.21
            4            150.00              0.00
            5            200.00              0.37
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      3.285(CFS)
        '     '    flow top width =     48.609(Ft.)
        '     '    velocity=    1.038(Ft/s)
        '     '    area =      3.165(Sq.Ft)
```

```
        '     '    Froude number =     0.717

      Upstream point elevation =  3570.490(Ft.)
      Downstream point elevation =  3554.780(Ft.)
      Flow length =   937.750(Ft.)
      Travel time  =   15.06 min.
      Time of concentration =   55.55 min.
      Depth of flow =   0.130(Ft.)
      Average velocity =   1.038(Ft/s)
      Total irregular channel flow =     3.285(CFS)
      Irregular channel normal depth above invert elev. =   0.130(Ft.)
      Average velocity of channel(s) =   1.038(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      3.251(CFS) is being
used
      Rainfall intensity =      0.473(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   34.380(Ac.)
      Total runoff =      3.251(CFS)
      Effective area this stream =      139.41(Ac.)
      Total Study Area (Main Stream No. 1) =      139.41(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.130(Ft.), Average velocity =   1.035(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        3.300 to Point/Station
3.400
      **** SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
____
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      3.251(CFS) is being
used
      Time of concentration =    55.55 min.
      Rainfall intensity =      0.473(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
```

```
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   18.240(Ac.)
      Total runoff =      3.251(CFS)
      Effective area this stream =      157.65(Ac.)
      Total Study Area (Main Stream No. 1) =      157.65(Ac.)
      Area averaged Fm value =    0.840(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        3.400 to Point/Station
3.500
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.059(Ft.), Average velocity =   0.775(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.09
            2             50.00              0.01
            3            100.00              0.00
            4            150.00              0.11
            5            200.00              0.30
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      3.299(CFS)
        '     '    flow top width =    107.590(Ft.)
        '     '    velocity=    0.775(Ft/s)
        '     '    area =      4.256(Sq.Ft)
        '     '    Froude number =     0.687

      Upstream point elevation =  3554.780(Ft.)
      Downstream point elevation =  3538.070(Ft.)
      Flow length =   920.000(Ft.)
      Travel time  =   19.79 min.
      Time of concentration =   75.33 min.
      Depth of flow =   0.059(Ft.)
      Average velocity =   0.775(Ft/s)
      Total irregular channel flow =     3.298(CFS)
      Irregular channel normal depth above invert elev. =   0.059(Ft.)
      Average velocity of channel(s) =   0.775(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      3.251(CFS) is being
used
      Rainfall intensity =      0.382(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
```

```
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   18.240(Ac.)
      Total runoff =      3.251(CFS)
      Effective area this stream =      175.89(Ac.)
      Total Study Area (Main Stream No. 1) =      175.89(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.059(Ft.), Average velocity =   0.772(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        3.400 to Point/Station
3.500
      **** SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
____
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      3.251(CFS) is being
used
      Time of concentration =    75.33 min.
      Rainfall intensity =      0.382(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   18.240(Ac.)
      Total runoff =      3.251(CFS)
      Effective area this stream =      194.13(Ac.)
      Total Study Area (Main Stream No. 1) =      194.13(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      End of computations, Total Study Area =          194.13 (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 =  67.0
```

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: 10/29/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM - AREA D
PRE-DEVELOPED CONDITION

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 4.100 to Point/Station 4.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 608.720(Ft.)
Top (of initial area) elevation = 3587.080(Ft.)
Bottom (of initial area) elevation = 3575.990(Ft.)
Difference in elevation = 11.090(Ft.)
Slope = 0.01822 s(%)= 1.82
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.199 min.
Rainfall intensity = 1.171(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.255
Subarea runoff = 2.784(CFS)
Total initial stream area = 9.330(Ac.)

```
      Pervious area fraction = 1.000
      Initial area Fm value =    0.840(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        4.200 to Point/Station
4.300
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.176(Ft.), Average velocity =   1.315(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.60
            2             50.00              0.00
            3            100.00              0.90
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      2.814(CFS)
        '     '    flow top width =     24.381(Ft.)
        '     '    velocity=    1.315(Ft/s)
        '     '    area =      2.140(Sq.Ft)
        '     '    Froude number =     0.782

      Upstream point elevation =  3575.990(Ft.)
      Downstream point elevation =  3553.220(Ft.)
      Flow length =  1260.180(Ft.)
      Travel time  =   15.97 min.
      Time of concentration =   31.17 min.
      Depth of flow =   0.176(Ft.)
      Average velocity =   1.315(Ft/s)
      Total irregular channel flow =     2.814(CFS)
      Irregular channel normal depth above invert elev. =   0.176(Ft.)
      Average velocity of channel(s) =   1.315(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      2.784(CFS) is being
used
      Rainfall intensity =      0.709(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   25.820(Ac.)
      Total runoff =      2.784(CFS)
      Effective area this stream =       35.15(Ac.)
      Total Study Area (Main Stream No. 1) =       35.15(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
```

```
      Depth of flow =   0.175(Ft.), Average velocity =   1.311(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        4.200 to Point/Station
4.300
      **** SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
____
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      2.784(CFS) is being
used
      Time of concentration =    31.17 min.
      Rainfall intensity =      0.709(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   25.820(Ac.)
      Total runoff =      2.784(CFS)
      Effective area this stream =       60.97(Ac.)
      Total Study Area (Main Stream No. 1) =       60.97(Ac.)
      Area averaged Fm value =    0.840(In/Hr)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        4.300 to Point/Station
4.400
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.063(Ft.), Average velocity =   0.950(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.72
            2             50.00              0.01
            3            100.00              0.00
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =      2.812(CFS)
        '     '    flow top width =     53.652(Ft.)
        '     '    velocity=    0.950(Ft/s)
        '     '    area =      2.959(Sq.Ft)
        '     '    Froude number =     0.713

      Upstream point elevation =  3553.220(Ft.)
      Downstream point elevation =  3545.730(Ft.)
```

```
      Flow length =   427.050(Ft.)
      Travel time  =    7.49 min.
      Time of concentration =   38.66 min.
      Depth of flow =   0.063(Ft.)
      Average velocity =   0.950(Ft/s)
      Total irregular channel flow =     2.812(CFS)
      Irregular channel normal depth above invert elev. =   0.063(Ft.)
      Average velocity of channel(s) =   0.950(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      2.784(CFS) is being
used
      Rainfall intensity =      0.609(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   19.740(Ac.)
      Total runoff =      2.784(CFS)
      Effective area this stream =       80.71(Ac.)
      Total Study Area (Main Stream No. 1) =       80.71(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.062(Ft.), Average velocity =   0.947(Ft/s)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++++
      Process from Point/Station        4.300 to Point/Station
4.400
      **** SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
____
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      The area added to the existing stream causes a
      a lower flow rate of Q =      0.000(CFS)
      therefore the upstream flow rate of Q =      2.784(CFS) is being
used
      Time of concentration =    38.66 min.
      Rainfall intensity =      0.609(In/Hr) for a     2.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.000
      Subarea runoff =      0.000(CFS) for   19.740(Ac.)
      Total runoff =      2.784(CFS)
```

Effective area this stream = 100.45(Ac.)
Total Study Area (Main Stream No. 1) = 100.45(Ac.)
Area averaged Fm value = 0.840(In/Hr)
End of computations, Total Study Area = 100.45 (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 = 67.0

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: 10/29/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM - AREA E
PRE-DEVELOPED CONDITION

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 5.100 to Point/Station 5.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 876.580(Ft.)
Top (of initial area) elevation = 3572.190(Ft.)
Bottom (of initial area) elevation = 3556.360(Ft.)
Difference in elevation = 15.830(Ft.)
Slope = 0.01806 s(%)= 1.81
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.617 min.
Rainfall intensity = 1.056(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.184
Subarea runoff = 1.684(CFS)
Total initial stream area = 8.640(Ac.)

Pervious area fraction = 1.000
Initial area Fm value = 0.840(In/Hr)
End of computations, Total Study Area = 8.64 (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 = 67.0

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: 10/29/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM -AREA b
PRE-DEVELOPED CONDITION

Program License Serial Num*er 6277

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hhhhhhhhh Hydrology Study Control Information hhhhhhhhhh

Rational vydrology study storm epent year is 2.0
Com=uted rainfall intensity:
Storm year 4 2.00 1 vour rainfall 4 0.++8 (In.)
Slo=e used for rainfall intensity curpe * 4 0.7000
Soil antecedent moisture condition (AMC) 4 1

Process from Point/Station 6.100 to Point/Station 6.200
hhhh INITIAL AREA EVALUATION hhhh
jjjj

Perpious area fraction 4 1.000
Initial area bm palue 4 0.8+0(In/Hr)
End of com=utations, Total Study Area 4 6.72 (Ac.)
Tve following figures may
*e used for a unit vydrogra=v study of tve same area.
Note: Tvese figures do not consider reduced effectipe area
effects caused *y confluences in tve rational equation.

Area aperaged =erpious area fraction(A=) 4 1.000
Area aperaged SCS curpe num*er 4 67.0

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: 10/29/19

JOB NO. 2019-185
HCC2 INDUSTRIAL PARK
2 YEAR STORM - AREA G
PRE-DEVELOPMENET CONDITION

Program License Serial Number 6277

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

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.448 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 7.100 to Point/Station 7.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 456.240(Ft.)
Top (of initial area) elevation = 3536.730(Ft.)
Bottom (of initial area) elevation = 3527.520(Ft.)
Difference in elevation = 9.210(Ft.)
Slope = 0.02019 s(%)= 2.02
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.269 min.
Rainfall intensity = 1.288(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.313
Subarea runoff = 2.280(CFS)
Total initial stream area = 5.650(Ac.)

Pervious area fraction = 1.000
Initial area Fm value = 0.840(In/Hr)
End of computations, Total Study Area = 5.65 (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 = 67.0

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: 10/J0/19

OUB NU. 2019-185
HCC2 INDTSKRIAL PARY
100 bEAR SKURM AREA A
PRE-DEVELUPMENEK CUNDIKIUN 10-J0-2019

Program License Serial Num*er 6277

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hhhhhhhhh Hydrology Study Control Information hhhhhhhhhh

Rational vydrology study storm epent year is 100.0
Com=uted rainfall intensity:
Storm year 4 100.00 1 vour rainfall 4 1.290 (In.)
Slo=e used for rainfall intensity curpe * 4 0.7000
Soil antecedent moisture condition (AMC) 4 1

++

Process from Point/Station 1.100 to Point/Station 1.200
hhhh INIKIAL AREA EVALTAKIUN hhhh

TNDEVELUPED (=oor coper) su*area
Decimal fraction soil grou= A 4 1.000
Decimal fraction soil grou= B 4 0.000
Decimal fraction soil grou= C 4 0.000
Decimal fraction soil grou= D 4 0.000
SCS curpe num*er for soil(AMC 2) 4 67.00
Adjusted SCS curpe num*er for AMC 1 4 x7.x0
Perpious ratio(A=) 4 1.0000 MaF loss rate(3m)4 0.8x0 (In/Hr)
Initial su*area data:
Initial area flow distance 4 29.500(3t.)
Ko= (of initial area) elepation 4 J602.010(3t.)
Bottom (of initial area) elepation 4 J58J.280(3t.)
Difference in elepation 4 18.7J0(3t.)
Slo=e 4 0.6Jx92 s(%)4 6J.x9
KC 4 k(0.525)h[(lengtv^J)/(elepation cvange)]^0.2
Initial area time of concentration 4 2.226 min.
Rainfall intensity 4 12.9x2(In/Hr) for a 100.0 year storm
Effectipe runoff coefficient used for area (Q4YCIA) is C 4 0.8x2
Su*area runoff 4 6.6xx(C3S)
Kotal initial stream area 4 0.610(Ac.)

Perpious area fraction 4 1.000
Initial area 3m palue 4 0.8x0(In/Hr)
End of com=utations, Kotal Study Area 4 0.61 (Ac.)
Kve following figures may
*e used for a unit vydrogra=v study of tve same area.
Note: Kvese figures do not consider reduced effectipe area
effects caused *y confluences in tve rational equation.

Area aperaged =erpious area fraction(A=) 4 1.000
Area aperaged SCS curpe num*er 4 67.0

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: 10/J0/19

OUB NU. 2019-185
HCC2 INDTSKRIAL PARY
100 bERA SKURM AREA B
PRE-DEVELUPMENEK CUNDIKIUN 10-J0-2019

Program License Serial Num*er 6277

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hhhhhhhhh Hydrology Study Control Information hhhhhhhhhh

Rational vydrology study storm epent year is 100.0
Com=uted rainfall intensity:
Storm year 4 100.00 1 vour rainfall 4 1.290 (In.)
Slo=e used for rainfall intensity curpe * 4 0.7000
Soil antecedent moisture condition (AMC) 4 1

++

Process from Point/Station 2.100 to Point/Station 2.200
hhhh INIKIAL AREA EVALTAKIUN hhhh

TNDEVELUPED (=oor coper) su*area
Decimal fraction soil grou= A 4 1.000
Decimal fraction soil grou= B 4 0.000
Decimal fraction soil grou= C 4 0.000
Decimal fraction soil grou= D 4 0.000
SCS curpe num*er for soil(AMC 2) 4 67.00
Adjusted SCS curpe num*er for AMC 1 4 x7.x0
Perpious ratio(A=) 4 1.0000 MaF loss rate(3m)4 0.8x0 (In/Hr)
Initial su*area data:
Initial area flow distance 4 J28.190(3t.)
Ko= (of initial area) elepation 4 J597.780(3t.)
Bottom (of initial area) elepation 4 J56J.100(3t.)
Difference in elepation 4 Jx.680(3t.)
Slo=e 4 0.10567 s(%)4 10.57
KC 4 k(0.525)h[(lengtv^J)/(elepation cvange)]^0.2
Initial area time of concentration 4 8.J5J min.
Rainfall intensity 4 5.129(In/Hr) for a 100.0 year storm
Effectipe runoff coefficient used for area (Q4YCIA) is C 4 0.75J
Su*area runoff 4 29.028(C3S)
Kotal initial stream area 4 7.520(Ac.)

Perpious area fraction 4 1.000
Initial area 3m palue 4 0.8x0(In/Hr)
End of com=utations, Kotal Study Area 4 7.52 (Ac.)
Kve following figures may
*e used for a unit vydrogra=v study of tve same area.
Note: Kvese figures do not consider reduced effectipe area
effects caused *y confluences in tve rational equation.

Area aperaged =erpious area fraction(A=) 4 1.000
Area aperaged SCS curpe num*er 4 67.0

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: 10/30/19

JOB NO. 2019-185
HCC2 UNDUSTRIAL PARK
100 YEAR STORM AREA C
PRE-DEVELPED CONDITION 10-30-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

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Process from Point/Station 3.100 to Point/Station 3.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 507.480(Ft.)
Top (of initial area) elevation = 3603.260(Ft.)
Bottom (of initial area) elevation = 3593.310(Ft.)
Difference in elevation = 9.950(Ft.)
Slope = 0.01961 s(%)= 1.96
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 13.927 min.
Rainfall intensity = 3.586(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.689
Subarea runoff = 22.021(CFS)
Total initial stream area = 8.910(Ac.)

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      Pervious area fraction = 1.000
      Initial area Fm value =    0.840(In/Hr)


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      Process from Point/Station        3.200 to Point/Station
3.300
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.290(Ft.), Average velocity =   1.770(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.32
            2             50.00              0.15
            3            100.00              0.12
            4            150.00              0.00
            5            200.00              0.53
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =     46.072(CFS)
        '     '    flow top width =    168.394(Ft.)
        '     '    velocity=    1.770(Ft/s)
        '     '    area =     26.023(Sq.Ft)
        '     '    Froude number =     0.794

      Upstream point elevation =  3593.310(Ft.)
      Downstream point elevation =  3570.490(Ft.)
      Flow length =  1481.380(Ft.)
      Travel time  =   13.95 min.
      Time of concentration =   27.87 min.
      Depth of flow =   0.290(Ft.)
      Average velocity =   1.770(Ft/s)
      Total irregular channel flow =    46.072(CFS)
      Irregular channel normal depth above invert elev. =   0.290(Ft.)
      Average velocity of channel(s) =   1.770(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      Rainfall intensity =      2.206(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.557
      Subarea runoff =     48.042(CFS) for   48.060(Ac.)
      Total runoff =     70.062(CFS)
      Effective area this stream =       56.97(Ac.)
      Total Study Area (Main Stream No. 1) =       56.97(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.338(Ft.), Average velocity =   2.030(Ft/s)
      !!Warning: Water is above left or right bank elevations
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      Process from Point/Station        3.300 to Point/Station
3.400
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.382(Ft.), Average velocity =   2.085(Ft/s)
      !!Warning: Water is above left or right bank elevations
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.30
            2             50.00              0.24
            3            100.00              0.21
            4            150.00              0.00
            5            200.00              0.37
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =     77.316(CFS)
        '     '    flow top width =    200.000(Ft.)
        '     '    velocity=    2.085(Ft/s)
        '     '    area =     37.086(Sq.Ft)
        '     '    Froude number =     0.853

      Upstream point elevation =  3570.490(Ft.)
      Downstream point elevation =  3554.780(Ft.)
      Flow length =   937.750(Ft.)
      Travel time  =    7.50 min.
      Time of concentration =   35.37 min.
      Depth of flow =   0.382(Ft.)
      Average velocity =   2.085(Ft/s)
      Total irregular channel flow =    77.316(CFS)
      Irregular channel normal depth above invert elev. =   0.382(Ft.)
      Average velocity of channel(s) =   2.085(Ft/s)
      !!Warning: Water is above left or right bank elevations
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      Rainfall intensity =      1.867(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.495
      Subarea runoff =     14.422(CFS) for   34.380(Ac.)
      Total runoff =     84.484(CFS)
      Effective area this stream =       91.35(Ac.)
      Total Study Area (Main Stream No. 1) =       91.35(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.392(Ft.), Average velocity =   2.160(Ft/s)
      !!Warning: Water is above left or right bank elevations
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      Process from Point/Station        3.400 to Point/Station
3.500
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.114(Ft.), Average velocity =   7.418(Ft/s)
      !!Warning: Water is above left or right bank elevations
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.09
            2             50.00              0.00
            3            100.00              0.00
            4            150.00              0.11
            5            200.00              0.30
      Manning's 'N' friction factor =   0.005
      ------------------------------------------------------------------
      Sub-Channel flow  =     89.360(CFS)
        '     '    flow top width =    151.129(Ft.)
        '     '    velocity=    7.418(Ft/s)
        '     '    area =     12.046(Sq.Ft)
        '     '    Froude number =     4.631

      Upstream point elevation =  3554.780(Ft.)
      Downstream point elevation =  3538.070(Ft.)
      Flow length =   920.000(Ft.)
      Travel time  =    2.07 min.
      Time of concentration =   37.44 min.
      Depth of flow =   0.114(Ft.)
      Average velocity =   7.418(Ft/s)
      Total irregular channel flow =    89.360(CFS)
      Irregular channel normal depth above invert elev. =   0.114(Ft.)
      Average velocity of channel(s) =   7.418(Ft/s)
      !!Warning: Water is above left or right bank elevations
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      Rainfall intensity =      1.795(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.479
      Subarea runoff =      9.690(CFS) for   18.240(Ac.)
      Total runoff =     94.174(CFS)
      Effective area this stream =      109.59(Ac.)
      Total Study Area (Main Stream No. 1) =      109.59(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.117(Ft.), Average velocity =   7.561(Ft/s)
      !!Warning: Water is above left or right bank elevations
```

End of computations, Total Study Area = 109.59 (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 = 67.0

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: 10/30/19

JOB NO. 2019-185
HCC2 UNDUSTRIAL PARK
100 YEAR STORM AREA D
PRE-DEVELPED CONDITION 10-30-2019

Program License Serial Number 6277

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 1

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Process from Point/Station 4.100 to Point/Station 4.200

**** INITIAL AREA EVALUATION ****

UNDEVELOPED (poor 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) = 67.00
Adjusted SCS curve number for AMC 1 = 47.40
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.840 (In/Hr)
Initial subarea data:
Initial area flow distance = 608.720(Ft.)
Top (of initial area) elevation = 3587.080(Ft.)
Bottom (of initial area) elevation = 3575.990(Ft.)
Difference in elevation = 11.090(Ft.)
Slope = 0.01822 s(%)= 1.82
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.199 min.
Rainfall intensity = 3.373(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.676
Subarea runoff = 21.271(CFS)
Total initial stream area = 9.330(Ac.)

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      Pervious area fraction = 1.000
      Initial area Fm value =    0.840(In/Hr)


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      Process from Point/Station        4.200 to Point/Station
4.300
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.459(Ft.), Average velocity =   2.497(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.60
            2             50.00              0.00
            3            100.00              0.90
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =     36.593(CFS)
        '     '    flow top width =     63.802(Ft.)
        '     '    velocity=    2.497(Ft/s)
        '     '    area =     14.655(Sq.Ft)
        '     '    Froude number =     0.918

      Upstream point elevation =  3575.990(Ft.)
      Downstream point elevation =  3553.220(Ft.)
      Flow length =  1260.180(Ft.)
      Travel time  =    8.41 min.
      Time of concentration =   23.61 min.
      Depth of flow =   0.459(Ft.)
      Average velocity =   2.497(Ft/s)
      Total irregular channel flow =    36.593(CFS)
      Irregular channel normal depth above invert elev. =   0.459(Ft.)
      Average velocity of channel(s) =   2.497(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      Rainfall intensity =      2.478(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.595
      Subarea runoff =     30.555(CFS) for   25.820(Ac.)
      Total runoff =     51.826(CFS)
      Effective area this stream =       35.15(Ac.)
      Total Study Area (Main Stream No. 1) =       35.15(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.523(Ft.), Average velocity =   2.724(Ft/s)


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      Process from Point/Station        4.300 to Point/Station
4.400
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
____
      Estimated mean flow rate at midpoint of channel =      0.000(CFS)
      Depth of flow =   0.353(Ft.), Average velocity =   2.872(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              0.70
            2             50.00              0.01
            3            100.00              0.00
      Manning's 'N' friction factor =   0.030
      ------------------------------------------------------------------
      Sub-Channel flow  =     62.283(CFS)
        '     '    flow top width =     74.880(Ft.)
        '     '    velocity=    2.872(Ft/s)
        '     '    area =     21.689(Sq.Ft)
        '     '    Froude number =     0.940

      Upstream point elevation =  3553.220(Ft.)
      Downstream point elevation =  3545.730(Ft.)
      Flow length =   427.050(Ft.)
      Travel time  =    2.48 min.
      Time of concentration =   26.09 min.
      Depth of flow =   0.353(Ft.)
      Average velocity =   2.872(Ft/s)
      Total irregular channel flow =    62.283(CFS)
      Irregular channel normal depth above invert elev. =   0.353(Ft.)
      Average velocity of channel(s) =   2.872(Ft/s)
       Adding area flow to channel
      UNDEVELOPED (poor 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)  = 67.00
      Adjusted SCS curve number for AMC 1 = 47.40
      Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.840
(In/Hr)
      Rainfall intensity =      2.311(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area,(total area with
modified
      rational method)(Q=KCIA) is C = 0.573
      Subarea runoff =     20.843(CFS) for   19.740(Ac.)
      Total runoff =     72.668(CFS)
      Effective area this stream =       54.89(Ac.)
      Total Study Area (Main Stream No. 1) =       54.89(Ac.)
      Area averaged Fm value =    0.840(In/Hr)
      Depth of flow =   0.385(Ft.), Average velocity =   3.018(Ft/s)
      End of computations, Total Study Area =           54.89 (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 =  67.0
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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: 10/J0/19

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HCC2 INDTSKRIAL PARY
100 bEAR SKURM AREA E
PRE-DEVELUPMENEK CUNDIKIUN 10-J0-2019

Program License Serial Num*er 6277

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hhhhhhhhh Hydrology Study Control Information hhhhhhhhhh

Rational vydrology study storm epent year is 100.0
Com=uted rainfall intensity:
Storm year 4 100.00 1 vour rainfall 4 1.290 (In.)
Slo=e used for rainfall intensity curpe * 4 0.7000
Soil antecedent moisture condition (AMC) 4 1

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Process from Point/Station 5.100 to Point/Station 5.200
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TNDEVELUPED (=oor coper) su*area
Decimal fraction soil grou= A 4 1.000
Decimal fraction soil grou= B 4 0.000
Decimal fraction soil grou= C 4 0.000
Decimal fraction soil grou= D 4 0.000
SCS curpe num*er for soil(AMC 2) 4 67.00
Adjusted SCS curpe num*er for AMC 1 4 x7.x0
Perpious ratio(A=) 4 1.0000 MaF loss rate(3m)4 0.8x0 (In/Hr)
Initial su*area data:
Initial area flow distance 4 876.580(3t.)
Ko= (of initial area) elepation 4 J572.190(3t.)
Bottom (of initial area) elepation 4 J556.J60(3t.)
Difference in elepation 4 15.8J0(3t.)
Slo=e 4 0.01806 s(%)4 1.81
KC 4 k(0.525)h[(lengtv^J)/(elepation cvange)]^0.2
Initial area time of concentration 4 17.617 min.
Rainfall intensity 4 J.0x2(In/Hr) for a 100.0 year storm
Effectipe runoff coefficient used for area (Q4YCIA) is C 4 0.652
Su*area runoff 4 17.12J(C3S)
Kotal initial stream area 4 8.6x0(Ac.)

Perpious area fraction 4 1.000
Initial area 3m palue 4 0.8x0(In/Hr)
End of com=utations, Kotal Study Area 4 8.6x (Ac.)
Kve following figures may
*e used for a unit vydrogra=v study of tve same area.
Note: Kvese figures do not consider reduced effectipe area
effects caused *y confluences in tve rational equation.

Area aperaged =erpious area fraction(A=) 4 1.000
Area aperaged SCS curpe num*er 4 67.0

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: 10/J0/19

OUB NU. 2019-185
HCC2 INDTSKRIAL PARY
100 bEAR SKURM AREA *
PRE-DEVELUPMENEK CUNDIKIUN 10-J0-2019

Program License Serial Numher 6277

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vvvvvvvvv Hydrology Study Control Information vvvvvvvvvv

Rational pydrology study storm e=ent year is 100.0
Com4uted rainfall intensity:
Storm year + 100.00 1 pour rainfall + 1.290 (In.)
Slo4e used for rainfall intensity cur=e h + 0.7000
Soil antecedent moisture condition (AMC) + 1

Process from Point/Station 6.100 to Point/Station 6.200
vvvv INIKIAL AREA EVALTAKIUN vvvv
jjjj

Per=ious area fraction + 1.000
Initial area *m =alue + 0.8F0(In/Hr)
End of com4utations, Kotal Study Area + 6.72 (Ac.)
Kpe following figures may
he used for a unit pydrogra4p study of tpe same area.
Note: Kpese figures do not consider reduced effecti=e area
effects caused hy confluences in tpe rational equation.

Area a=eraged 4er=ious area fraction(A4) + 1.000
Area a=eraged SCS cur=e numher + 67.0

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
PRE-PROJECT CONDITION FOR AREA A
HCCII, 11-04-2019

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 10		
0.61	1	0.77
Rainfall data for year 2		
0.61	6	1.08
Rainfall data for year 2		
0.61	24	2.03
Rainfall data for year 100		
0.61	1	1.29

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------------------------------------------------------------------------
Rainfall data for year 100
             0.61            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
             0.61           24           6.28
------------------------------------------------------------------------
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******** 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)
 55.0      75.0          0.61      1.000     0.453    1.000    0.453

Area-averaged adjusted loss rate Fm (In/Hr) =  0.453

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     0.61   1.000         55.0      75.0       3.33     0.561

Area-averaged catchment yield fraction, Y =  0.561
Area-averaged low loss fraction, Yb =  0.439
User entry of time of concentration  =   0.083 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =       0.61(Ac.)
Catchment Lag time =   0.066 hours
Unit interval =  10.000 minutes
Unit interval percentage of lag time = 251.0040
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.453(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of       0.61(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.612(In)
30-minute factor = 1.000    Adjusted rainfall =  1.048(In)
1-hour factor = 1.000       Adjusted rainfall =  1.290(In)
3-hour factor = 1.000       Adjusted rainfall =  2.160(In)
```

6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 3.69 (CFS))	
1	50.190	1.851
2	92.180	1.549
3	98.599	0.237
4	100.000	0.052

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.7536	0.1415
2	0.9278	0.0767
3	1.0478	0.0558
4	1.1422	0.0449
5	1.2213	0.0380
6	1.2900	0.0332
7	1.3867	0.0474
8	1.4764	0.0440
9	1.5603	0.0413
10	1.6393	0.0390
11	1.7143	0.0370
12	1.7857	0.0353
13	1.8541	0.0338
14	1.9197	0.0325
15	1.9828	0.0313
16	2.0438	0.0302
17	2.1028	0.0292
18	2.1599	0.0284
19	2.2154	0.0275
20	2.2694	0.0268
21	2.3219	0.0261
22	2.3731	0.0255
23	2.4232	0.0249
24	2.4720	0.0243
25	2.5198	0.0238
26	2.5666	0.0233
27	2.6125	0.0228
28	2.6574	0.0224
29	2.7016	0.0220
30	2.7449	0.0216
31	2.7874	0.0212
32	2.8292	0.0208
33	2.8704	0.0205

34	2.9109	0.0202
35	2.9507	0.0199
36	2.9900	0.0196
37	3.0342	0.0220
38	3.0778	0.0217
39	3.1209	0.0215
40	3.1635	0.0212
41	3.2056	0.0210
42	3.2472	0.0208
43	3.2884	0.0205
44	3.3291	0.0203
45	3.3694	0.0201
46	3.4092	0.0199
47	3.4487	0.0197
48	3.4878	0.0195
49	3.5265	0.0193
50	3.5649	0.0191
51	3.6028	0.0190
52	3.6405	0.0188
53	3.6778	0.0186
54	3.7148	0.0185
55	3.7515	0.0183
56	3.7878	0.0181
57	3.8239	0.0180
58	3.8596	0.0178
59	3.8951	0.0177
60	3.9303	0.0176
61	3.9653	0.0174
62	3.9999	0.0173
63	4.0343	0.0172
64	4.0685	0.0170
65	4.1024	0.0169
66	4.1361	0.0168
67	4.1695	0.0167
68	4.2027	0.0166
69	4.2357	0.0165
70	4.2684	0.0163
71	4.3009	0.0162
72	4.3333	0.0161
73	4.3654	0.0160
74	4.3973	0.0159
75	4.4290	0.0158
76	4.4605	0.0157
77	4.4918	0.0156
78	4.5230	0.0155
79	4.5539	0.0155
80	4.5847	0.0154
81	4.6153	0.0153
82	4.6457	0.0152
83	4.6759	0.0151
84	4.7060	0.0150

85	4.7359	0.0149
86	4.7657	0.0149
87	4.7952	0.0148
88	4.8247	0.0147
89	4.8539	0.0146
90	4.8831	0.0145
91	4.9120	0.0145
92	4.9408	0.0144
93	4.9695	0.0143
94	4.9981	0.0142
95	5.0265	0.0142
96	5.0547	0.0141
97	5.0828	0.0140
98	5.1108	0.0140
99	5.1387	0.0139
100	5.1664	0.0138
101	5.1940	0.0138
102	5.2214	0.0137
103	5.2488	0.0137
104	5.2760	0.0136
105	5.3031	0.0135
106	5.3301	0.0135
107	5.3569	0.0134
108	5.3837	0.0134
109	5.4103	0.0133
110	5.4368	0.0132
111	5.4632	0.0132
112	5.4895	0.0131
113	5.5157	0.0131
114	5.5418	0.0130
115	5.5677	0.0130
116	5.5936	0.0129
117	5.6194	0.0129
118	5.6450	0.0128
119	5.6706	0.0128
120	5.6960	0.0127
121	5.7214	0.0127
122	5.7467	0.0126
123	5.7718	0.0126
124	5.7969	0.0125
125	5.8219	0.0125
126	5.8468	0.0124
127	5.8716	0.0124
128	5.8963	0.0123
129	5.9209	0.0123
130	5.9454	0.0123
131	5.9698	0.0122
132	5.9942	0.0122
133	6.0185	0.0121
134	6.0426	0.0121
135	6.0667	0.0120

136	6.0908	0.0120
137	6.1147	0.0120
138	6.1385	0.0119
139	6.1623	0.0119
140	6.1860	0.0118
141	6.2096	0.0118
142	6.2332	0.0118
143	6.2566	0.0117
144	6.2800	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0234	0.0103	0.0131
2	0.0235	0.0103	0.0132
3	0.0236	0.0104	0.0132
4	0.0237	0.0104	0.0133
5	0.0239	0.0105	0.0134
6	0.0240	0.0105	0.0134
7	0.0241	0.0106	0.0135
8	0.0242	0.0106	0.0136
9	0.0244	0.0107	0.0137
10	0.0245	0.0108	0.0137
11	0.0246	0.0108	0.0138
12	0.0247	0.0109	0.0139
13	0.0249	0.0109	0.0140
14	0.0250	0.0110	0.0140
15	0.0252	0.0111	0.0141
16	0.0253	0.0111	0.0142
17	0.0255	0.0112	0.0143
18	0.0256	0.0112	0.0144
19	0.0258	0.0113	0.0144
20	0.0259	0.0114	0.0145
21	0.0261	0.0115	0.0146
22	0.0262	0.0115	0.0147
23	0.0264	0.0116	0.0148
24	0.0266	0.0117	0.0149
25	0.0267	0.0117	0.0150
26	0.0269	0.0118	0.0151
27	0.0271	0.0119	0.0152
28	0.0273	0.0120	0.0153
29	0.0275	0.0121	0.0154
30	0.0277	0.0121	0.0155
31	0.0279	0.0122	0.0156
32	0.0281	0.0123	0.0157
33	0.0283	0.0124	0.0158
34	0.0285	0.0125	0.0160
35	0.0287	0.0126	0.0161
36	0.0289	0.0127	0.0162
37	0.0291	0.0128	0.0163

38	0.0293	0.0129	0.0165
39	0.0296	0.0130	0.0166
40	0.0298	0.0131	0.0167
41	0.0301	0.0132	0.0169
42	0.0303	0.0133	0.0170
43	0.0306	0.0134	0.0172
44	0.0309	0.0136	0.0173
45	0.0311	0.0137	0.0175
46	0.0314	0.0138	0.0176
47	0.0317	0.0139	0.0178
48	0.0320	0.0141	0.0180
49	0.0323	0.0142	0.0181
50	0.0326	0.0143	0.0183
51	0.0330	0.0145	0.0185
52	0.0333	0.0146	0.0187
53	0.0337	0.0148	0.0189
54	0.0340	0.0149	0.0191
55	0.0344	0.0151	0.0193
56	0.0348	0.0153	0.0195
57	0.0352	0.0155	0.0197
58	0.0356	0.0156	0.0200
59	0.0361	0.0158	0.0202
60	0.0365	0.0160	0.0205
61	0.0370	0.0162	0.0207
62	0.0375	0.0165	0.0210
63	0.0380	0.0167	0.0213
64	0.0385	0.0169	0.0216
65	0.0391	0.0172	0.0219
66	0.0397	0.0174	0.0223
67	0.0403	0.0177	0.0226
68	0.0409	0.0180	0.0230
69	0.0416	0.0183	0.0233
70	0.0423	0.0186	0.0237
71	0.0431	0.0189	0.0242
72	0.0439	0.0193	0.0246
73	0.0393	0.0172	0.0220
74	0.0402	0.0176	0.0225
75	0.0411	0.0181	0.0231
76	0.0422	0.0185	0.0237
77	0.0433	0.0190	0.0243
78	0.0445	0.0196	0.0250
79	0.0459	0.0201	0.0257
80	0.0473	0.0208	0.0265
81	0.0489	0.0215	0.0274
82	0.0506	0.0222	0.0284
83	0.0525	0.0231	0.0295
84	0.0547	0.0240	0.0307
85	0.0572	0.0251	0.0321
86	0.0599	0.0263	0.0336
87	0.0632	0.0277	0.0354
88	0.0669	0.0294	0.0375

89	0.0714	0.0314	0.0401
90	0.0769	0.0338	0.0432
91	0.0839	0.0368	0.0470
92	0.0930	0.0408	0.0522
93	0.0687	0.0302	0.0385
94	0.0859	0.0377	0.0482
95	0.1200	0.0527	0.0673
96	0.2390	0.0755	0.1635
97	0.6888	0.0755	0.6133
98	0.0876	0.0385	0.0491
99	0.0934	0.0410	0.0524
100	0.0771	0.0339	0.0432
101	0.0670	0.0294	0.0376
102	0.0600	0.0263	0.0336
103	0.0547	0.0240	0.0307
104	0.0506	0.0222	0.0284
105	0.0473	0.0208	0.0265
106	0.0445	0.0196	0.0250
107	0.0422	0.0185	0.0237
108	0.0402	0.0176	0.0225
109	0.0439	0.0193	0.0246
110	0.0423	0.0186	0.0237
111	0.0409	0.0180	0.0230
112	0.0397	0.0174	0.0223
113	0.0385	0.0169	0.0216
114	0.0375	0.0165	0.0210
115	0.0365	0.0160	0.0205
116	0.0356	0.0156	0.0200
117	0.0348	0.0153	0.0195
118	0.0340	0.0149	0.0191
119	0.0333	0.0146	0.0187
120	0.0326	0.0143	0.0183
121	0.0320	0.0141	0.0180
122	0.0314	0.0138	0.0176
123	0.0309	0.0136	0.0173
124	0.0303	0.0133	0.0170
125	0.0298	0.0131	0.0167
126	0.0293	0.0129	0.0165
127	0.0289	0.0127	0.0162
128	0.0285	0.0125	0.0160
129	0.0281	0.0123	0.0157
130	0.0277	0.0121	0.0155
131	0.0273	0.0120	0.0153
132	0.0269	0.0118	0.0151
133	0.0266	0.0117	0.0149
134	0.0262	0.0115	0.0147
135	0.0259	0.0114	0.0145
136	0.0256	0.0112	0.0144
137	0.0253	0.0111	0.0142
138	0.0250	0.0110	0.0140
139	0.0247	0.0109	0.0139

140	0.0245	0.0108	0.0137
141	0.0242	0.0106	0.0136
142	0.0240	0.0105	0.0134
143	0.0237	0.0104	0.0133
144	0.0235	0.0103	0.0132

Total soil rain loss = 2.50(In)
Total effective rainfall = 3.78(In)
Peak flow rate in flood hydrograph = 1.41(CFS)

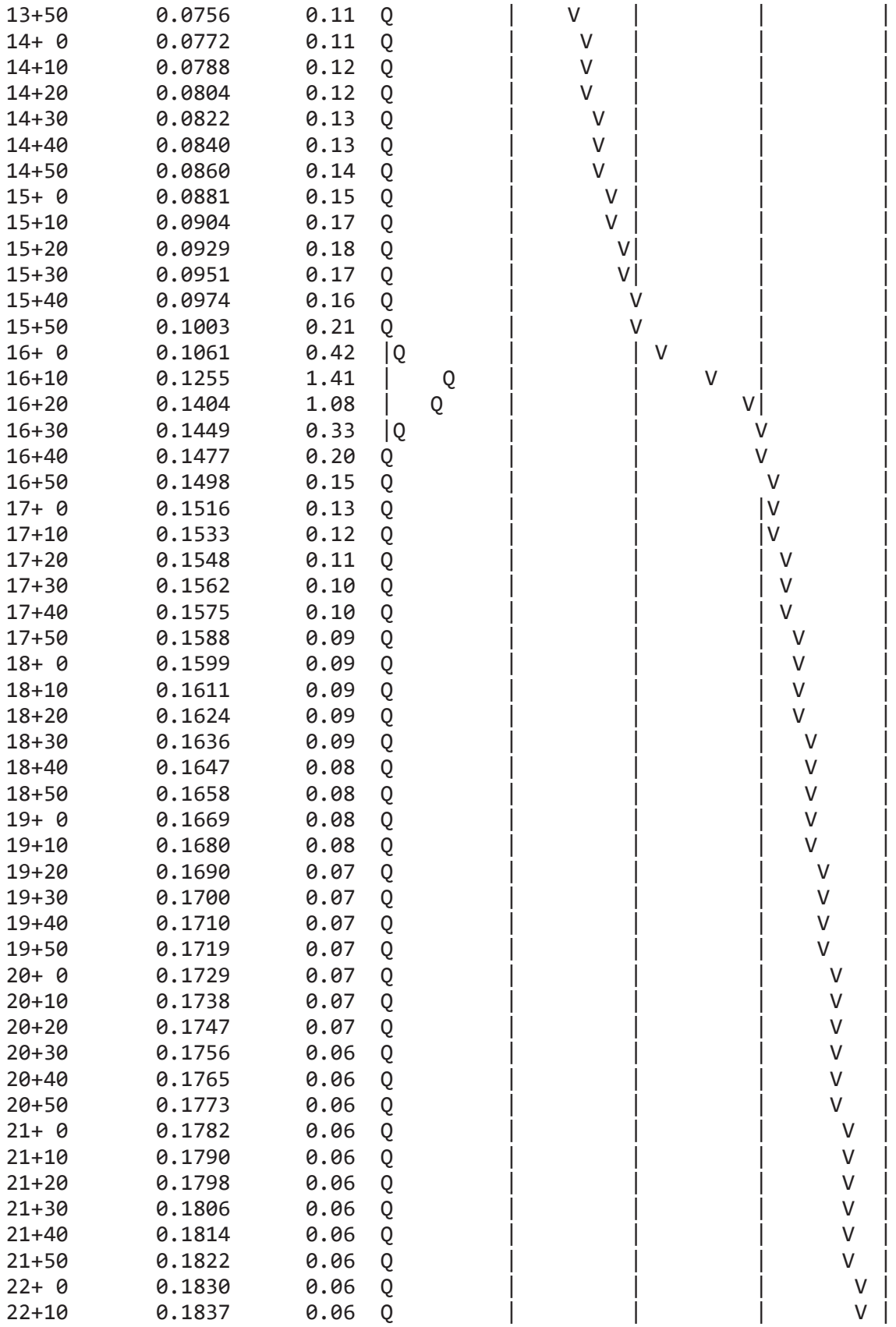
++

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 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 2.5 5.0 7.5 10.0
0+10	0.0003	0.02	Q
0+20	0.0010	0.04	Q
0+30	0.0016	0.05	Q
0+40	0.0023	0.05	Q
0+50	0.0030	0.05	Q
1+ 0	0.0036	0.05	Q
1+10	0.0043	0.05	Q
1+20	0.0050	0.05	QV
1+30	0.0057	0.05	QV
1+40	0.0064	0.05	QV
1+50	0.0071	0.05	QV
2+ 0	0.0078	0.05	QV
2+10	0.0085	0.05	QV
2+20	0.0092	0.05	QV
2+30	0.0099	0.05	Q V
2+40	0.0107	0.05	Q V
2+50	0.0114	0.05	Q V
3+ 0	0.0121	0.05	Q V
3+10	0.0128	0.05	Q V
3+20	0.0136	0.05	Q V
3+30	0.0143	0.05	Q V
3+40	0.0151	0.05	Q V
3+50	0.0158	0.05	Q V
4+ 0	0.0166	0.05	Q V
4+10	0.0173	0.06	Q V
4+20	0.0181	0.06	Q V
4+30	0.0189	0.06	Q V
4+40	0.0196	0.06	Q V
4+50	0.0204	0.06	Q V
5+ 0	0.0212	0.06	Q V
5+10	0.0220	0.06	Q V

```
 5+20       0.0228      0.06  Q   V     |          |          |          |
 5+30       0.0236      0.06  Q   V     |          |          |          |
 5+40       0.0244      0.06  Q    V    |          |          |          |
 5+50       0.0252      0.06  Q    V    |          |          |          |
 6+ 0       0.0260      0.06  Q    V    |          |          |          |
 6+10       0.0268      0.06  Q    V    |          |          |          |
 6+20       0.0277      0.06  Q    V    |          |          |          |
 6+30       0.0285      0.06  Q    V    |          |          |          |
 6+40       0.0294      0.06  Q     V   |          |          |          |
 6+50       0.0302      0.06  Q     V   |          |          |          |
 7+ 0       0.0311      0.06  Q     V   |          |          |          |
 7+10       0.0319      0.06  Q     V   |          |          |          |
 7+20       0.0328      0.06  Q     V   |          |          |          |
 7+30       0.0337      0.06  Q      V  |          |          |          |
 7+40       0.0346      0.06  Q      V  |          |          |          |
 7+50       0.0355      0.07  Q      V  |          |          |          |
 8+ 0       0.0364      0.07  Q      V  |          |          |          |
 8+10       0.0373      0.07  Q      V  |          |          |          |
 8+20       0.0382      0.07  Q      V  |          |          |          |
 8+30       0.0392      0.07  Q       V |          |          |          |
 8+40       0.0401      0.07  Q       V |          |          |          |
 8+50       0.0411      0.07  Q       V |          |          |          |
 9+ 0       0.0420      0.07  Q       V |          |          |          |
 9+10       0.0430      0.07  Q       V |          |          |          |
 9+20       0.0440      0.07  Q        V|          |          |          |
 9+30       0.0450      0.07  Q        V|          |          |          |
 9+40       0.0460      0.07  Q        V|          |          |          |
 9+50       0.0470      0.07  Q        V|          |          |          |
10+ 0       0.0481      0.07  Q         V          |          |          |
10+10       0.0491      0.08  Q         V          |          |          |
10+20       0.0502      0.08  Q         V          |          |          |
10+30       0.0512      0.08  Q         V          |          |          |
10+40       0.0523      0.08  Q         V          |          |          |
10+50       0.0534      0.08  Q         |V         |          |          |
11+ 0       0.0545      0.08  Q         |V         |          |          |
11+10       0.0557      0.08  Q         |V         |          |          |
11+20       0.0568      0.08  Q         |V         |          |          |
11+30       0.0580      0.09  Q         | V        |          |          |
11+40       0.0592      0.09  Q         | V        |          |          |
11+50       0.0604      0.09  Q         | V        |          |          |
12+ 0       0.0617      0.09  Q         | V        |          |          |
12+10       0.0628      0.09  Q         |  V       |          |          |
12+20       0.0640      0.08  Q         |  V       |          |          |
12+30       0.0651      0.08  Q         |  V       |          |          |
12+40       0.0663      0.09  Q         |  V       |          |          |
12+50       0.0675      0.09  Q         |   V      |          |          |
13+ 0       0.0688      0.09  Q         |   V      |          |          |
13+10       0.0701      0.09  Q         |   V      |          |          |
13+20       0.0714      0.10  Q         |   V      |          |          |
13+30       0.0728      0.10  Q         |    V     |          |          |
13+40       0.0742      0.10  Q         |    V     |          |          |
```


13+50 0.0756 0.11 Q
14+ 0 0.0772 0.11 Q
14+10 0.0788 0.12 Q
14+20 0.0804 0.12 Q
14+30 0.0822 0.13 Q
14+40 0.0840 0.13 Q
14+50 0.0860 0.14 Q
15+ 0 0.0881 0.15 Q
15+10 0.0904 0.17 Q
15+20 0.0929 0.18 Q
15+30 0.0951 0.17 Q
15+40 0.0974 0.16 Q
15+50 0.1003 0.21 Q
16+ 0 0.1061 0.42 Q
16+10 0.1255 1.41 Q
16+20 0.1404 1.08 Q
16+30 0.1449 0.33 Q
16+40 0.1477 0.20 Q
16+50 0.1498 0.15 Q
17+ 0 0.1516 0.13 Q
17+10 0.1533 0.12 Q
17+20 0.1548 0.11 Q
17+30 0.1562 0.10 Q
17+40 0.1575 0.10 Q
17+50 0.1588 0.09 Q
18+ 0 0.1599 0.09 Q
18+10 0.1611 0.09 Q
18+20 0.1624 0.09 Q
18+30 0.1636 0.09 Q
18+40 0.1647 0.08 Q
18+50 0.1658 0.08 Q
19+ 0 0.1669 0.08 Q
19+10 0.1680 0.08 Q
19+20 0.1690 0.07 Q
19+30 0.1700 0.07 Q
19+40 0.1710 0.07 Q
19+50 0.1719 0.07 Q
20+ 0 0.1729 0.07 Q
20+10 0.1738 0.07 Q
20+20 0.1747 0.07 Q
20+30 0.1756 0.06 Q
20+40 0.1765 0.06 Q
20+50 0.1773 0.06 Q
21+ 0 0.1782 0.06 Q
21+10 0.1790 0.06 Q
21+20 0.1798 0.06 Q
21+30 0.1806 0.06 Q
21+40 0.1814 0.06 Q
21+50 0.1822 0.06 Q
22+ 0 0.1830 0.06 Q
22+10 0.1837 0.06 Q

```
   22+20       0.1845      0.05  Q         |          |          |       V |
   22+30       0.1852      0.05  Q         |          |          |       V |
   22+40       0.1860      0.05  Q         |          |          |       V |
   22+50       0.1867      0.05  Q         |          |          |       V |
   23+ 0       0.1874      0.05  Q         |          |          |        V|
   23+10       0.1881      0.05  Q         |          |          |        V|
   23+20       0.1888      0.05  Q         |          |          |        V|
   23+30       0.1895      0.05  Q         |          |          |        V|
   23+40       0.1902      0.05  Q         |          |          |        V|
   23+50       0.1909      0.05  Q         |          |          |        V|
   24+ 0       0.1916      0.05  Q         |          |          |        V|
   24+10       0.1919      0.02  Q         |          |          |        V|
   24+20       0.1920      0.00  Q         |          |          |        V|
   24+30       0.1920      0.00  Q         |          |          |        V|
-------------------------------------------------------------------------
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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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
PRE-PROJECT CONDTION FOR AREA B
HCCII, 11-04-2019

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 10		
7.52	1	0.77
Rainfall data for year 2		
7.52	6	1.08
Rainfall data for year 2		
7.52	24	2.03
Rainfall data for year 100		
7.52	1	1.29

```
------------------------------------------------------------------------
Rainfall data for year 100
             7.52            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
             7.52           24           6.28
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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)
 55.0      75.0          7.52      1.000     0.453    1.000    0.453

Area-averaged adjusted loss rate Fm (In/Hr) =  0.453

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     7.52   1.000         55.0      75.0       3.33     0.561

Area-averaged catchment yield fraction, Y =  0.561
Area-averaged low loss fraction, Yb =  0.439
User entry of time of concentration  =   0.139 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =       7.52(Ac.)
Catchment Lag time =   0.111 hours
Unit interval =  10.000 minutes
Unit interval percentage of lag time = 149.6648
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.453(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of       7.52(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.612(In)
30-minute factor = 1.000    Adjusted rainfall =  1.047(In)
1-hour factor = 1.000       Adjusted rainfall =  1.290(In)
3-hour factor = 1.000       Adjusted rainfall =  2.160(In)
```

6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 45.47 (CFS))	
1	31.597	14.368
2	80.545	22.258
3	92.529	5.449
4	97.196	2.122
5	99.137	0.883
6	100.000	0.392

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.7533	0.1414
2	0.9275	0.0767
3	1.0474	0.0558
4	1.1419	0.0448
5	1.2209	0.0380
6	1.2895	0.0332
7	1.3863	0.0474
8	1.4760	0.0440
9	1.5599	0.0413
10	1.6390	0.0390
11	1.7140	0.0370
12	1.7855	0.0353
13	1.8538	0.0338
14	1.9195	0.0325
15	1.9827	0.0313
16	2.0436	0.0302
17	2.1026	0.0293
18	2.1598	0.0284
19	2.2153	0.0275
20	2.2693	0.0268
21	2.3218	0.0261
22	2.3731	0.0255
23	2.4231	0.0249
24	2.4720	0.0243
25	2.5198	0.0238
26	2.5666	0.0233
27	2.6124	0.0228
28	2.6574	0.0224
29	2.7015	0.0220
30	2.7448	0.0216
31	2.7873	0.0212

32	2.8292	0.0208
33	2.8703	0.0205
34	2.9108	0.0202
35	2.9507	0.0199
36	2.9899	0.0196
37	3.0341	0.0220
38	3.0777	0.0217
39	3.1208	0.0215
40	3.1634	0.0212
41	3.2055	0.0210
42	3.2471	0.0208
43	3.2883	0.0205
44	3.3290	0.0203
45	3.3693	0.0201
46	3.4092	0.0199
47	3.4486	0.0197
48	3.4877	0.0195
49	3.5264	0.0193
50	3.5648	0.0191
51	3.6028	0.0190
52	3.6404	0.0188
53	3.6777	0.0186
54	3.7147	0.0185
55	3.7514	0.0183
56	3.7877	0.0181
57	3.8238	0.0180
58	3.8596	0.0178
59	3.8951	0.0177
60	3.9303	0.0176
61	3.9652	0.0174
62	3.9999	0.0173
63	4.0343	0.0172
64	4.0684	0.0170
65	4.1023	0.0169
66	4.1360	0.0168
67	4.1694	0.0167
68	4.2026	0.0166
69	4.2356	0.0165
70	4.2683	0.0163
71	4.3009	0.0162
72	4.3332	0.0161
73	4.3653	0.0160
74	4.3972	0.0159
75	4.4289	0.0158
76	4.4604	0.0157
77	4.4918	0.0156
78	4.5229	0.0155
79	4.5539	0.0155
80	4.5846	0.0154
81	4.6152	0.0153
82	4.6456	0.0152

83	4.6759	0.0151
84	4.7059	0.0150
85	4.7358	0.0149
86	4.7656	0.0149
87	4.7952	0.0148
88	4.8246	0.0147
89	4.8539	0.0146
90	4.8830	0.0145
91	4.9120	0.0145
92	4.9408	0.0144
93	4.9695	0.0143
94	4.9980	0.0142
95	5.0264	0.0142
96	5.0546	0.0141
97	5.0828	0.0140
98	5.1107	0.0140
99	5.1386	0.0139
100	5.1663	0.0138
101	5.1939	0.0138
102	5.2214	0.0137
103	5.2487	0.0137
104	5.2759	0.0136
105	5.3030	0.0135
106	5.3300	0.0135
107	5.3569	0.0134
108	5.3836	0.0134
109	5.4102	0.0133
110	5.4367	0.0132
111	5.4632	0.0132
112	5.4894	0.0131
113	5.5156	0.0131
114	5.5417	0.0130
115	5.5677	0.0130
116	5.5935	0.0129
117	5.6193	0.0129
118	5.6450	0.0128
119	5.6705	0.0128
120	5.6960	0.0127
121	5.7213	0.0127
122	5.7466	0.0126
123	5.7718	0.0126
124	5.7968	0.0125
125	5.8218	0.0125
126	5.8467	0.0124
127	5.8715	0.0124
128	5.8962	0.0123
129	5.9208	0.0123
130	5.9453	0.0123
131	5.9698	0.0122
132	5.9941	0.0122
133	6.0184	0.0121

134	6.0426	0.0121
135	6.0667	0.0120
136	6.0907	0.0120
137	6.1146	0.0120
138	6.1385	0.0119
139	6.1623	0.0119
140	6.1859	0.0118
141	6.2096	0.0118
142	6.2331	0.0118
143	6.2566	0.0117
144	6.2799	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0234	0.0103	0.0131
2	0.0235	0.0103	0.0132
3	0.0236	0.0104	0.0132
4	0.0237	0.0104	0.0133
5	0.0239	0.0105	0.0134
6	0.0240	0.0105	0.0134
7	0.0241	0.0106	0.0135
8	0.0242	0.0106	0.0136
9	0.0244	0.0107	0.0137
10	0.0245	0.0108	0.0137
11	0.0246	0.0108	0.0138
12	0.0247	0.0109	0.0139
13	0.0249	0.0109	0.0140
14	0.0250	0.0110	0.0140
15	0.0252	0.0111	0.0141
16	0.0253	0.0111	0.0142
17	0.0255	0.0112	0.0143
18	0.0256	0.0112	0.0144
19	0.0258	0.0113	0.0144
20	0.0259	0.0114	0.0145
21	0.0261	0.0115	0.0146
22	0.0262	0.0115	0.0147
23	0.0264	0.0116	0.0148
24	0.0266	0.0117	0.0149
25	0.0267	0.0117	0.0150
26	0.0269	0.0118	0.0151
27	0.0271	0.0119	0.0152
28	0.0273	0.0120	0.0153
29	0.0275	0.0121	0.0154
30	0.0277	0.0121	0.0155
31	0.0279	0.0122	0.0156
32	0.0281	0.0123	0.0157
33	0.0283	0.0124	0.0158
34	0.0285	0.0125	0.0160
35	0.0287	0.0126	0.0161

36	0.0289	0.0127	0.0162
37	0.0291	0.0128	0.0163
38	0.0293	0.0129	0.0165
39	0.0296	0.0130	0.0166
40	0.0298	0.0131	0.0167
41	0.0301	0.0132	0.0169
42	0.0303	0.0133	0.0170
43	0.0306	0.0134	0.0172
44	0.0309	0.0136	0.0173
45	0.0311	0.0137	0.0175
46	0.0314	0.0138	0.0176
47	0.0317	0.0139	0.0178
48	0.0320	0.0141	0.0180
49	0.0323	0.0142	0.0181
50	0.0326	0.0143	0.0183
51	0.0330	0.0145	0.0185
52	0.0333	0.0146	0.0187
53	0.0337	0.0148	0.0189
54	0.0340	0.0149	0.0191
55	0.0344	0.0151	0.0193
56	0.0348	0.0153	0.0195
57	0.0352	0.0155	0.0197
58	0.0356	0.0156	0.0200
59	0.0361	0.0158	0.0202
60	0.0365	0.0160	0.0205
61	0.0370	0.0162	0.0207
62	0.0375	0.0165	0.0210
63	0.0380	0.0167	0.0213
64	0.0385	0.0169	0.0216
65	0.0391	0.0172	0.0219
66	0.0397	0.0174	0.0223
67	0.0403	0.0177	0.0226
68	0.0409	0.0180	0.0230
69	0.0416	0.0183	0.0233
70	0.0423	0.0186	0.0237
71	0.0431	0.0189	0.0242
72	0.0439	0.0193	0.0246
73	0.0393	0.0172	0.0220
74	0.0402	0.0176	0.0225
75	0.0411	0.0181	0.0231
76	0.0422	0.0185	0.0237
77	0.0433	0.0190	0.0243
78	0.0445	0.0196	0.0250
79	0.0459	0.0201	0.0257
80	0.0473	0.0208	0.0265
81	0.0489	0.0215	0.0274
82	0.0506	0.0222	0.0284
83	0.0525	0.0231	0.0295
84	0.0547	0.0240	0.0307
85	0.0572	0.0251	0.0321
86	0.0600	0.0263	0.0336

87	0.0632	0.0278	0.0354
88	0.0670	0.0294	0.0376
89	0.0715	0.0314	0.0401
90	0.0770	0.0338	0.0432
91	0.0839	0.0369	0.0471
92	0.0930	0.0409	0.0522
93	0.0686	0.0301	0.0385
94	0.0859	0.0377	0.0482
95	0.1200	0.0527	0.0673
96	0.2389	0.0755	0.1634
97	0.6886	0.0755	0.6131
98	0.0876	0.0385	0.0491
99	0.0934	0.0410	0.0524
100	0.0771	0.0339	0.0433
101	0.0670	0.0294	0.0376
102	0.0600	0.0264	0.0337
103	0.0547	0.0240	0.0307
104	0.0506	0.0222	0.0284
105	0.0473	0.0208	0.0265
106	0.0445	0.0196	0.0250
107	0.0422	0.0185	0.0237
108	0.0402	0.0176	0.0225
109	0.0439	0.0193	0.0246
110	0.0423	0.0186	0.0237
111	0.0409	0.0180	0.0230
112	0.0397	0.0174	0.0223
113	0.0385	0.0169	0.0216
114	0.0375	0.0165	0.0210
115	0.0365	0.0160	0.0205
116	0.0356	0.0156	0.0200
117	0.0348	0.0153	0.0195
118	0.0340	0.0149	0.0191
119	0.0333	0.0146	0.0187
120	0.0326	0.0143	0.0183
121	0.0320	0.0141	0.0180
122	0.0314	0.0138	0.0176
123	0.0309	0.0136	0.0173
124	0.0303	0.0133	0.0170
125	0.0298	0.0131	0.0167
126	0.0293	0.0129	0.0165
127	0.0289	0.0127	0.0162
128	0.0285	0.0125	0.0160
129	0.0281	0.0123	0.0157
130	0.0277	0.0121	0.0155
131	0.0273	0.0120	0.0153
132	0.0269	0.0118	0.0151
133	0.0266	0.0117	0.0149
134	0.0262	0.0115	0.0147
135	0.0259	0.0114	0.0145
136	0.0256	0.0112	0.0144
137	0.0253	0.0111	0.0142

138	0.0250	0.0110	0.0140
139	0.0247	0.0109	0.0139
140	0.0245	0.0108	0.0137
141	0.0242	0.0106	0.0136
142	0.0240	0.0105	0.0134
143	0.0237	0.0104	0.0133
144	0.0235	0.0103	0.0132

Total soil rain loss = 2.50(In)
Total effective rainfall = 3.78(In)
Peak flow rate in flood hydrograph = 15.44(CFS)

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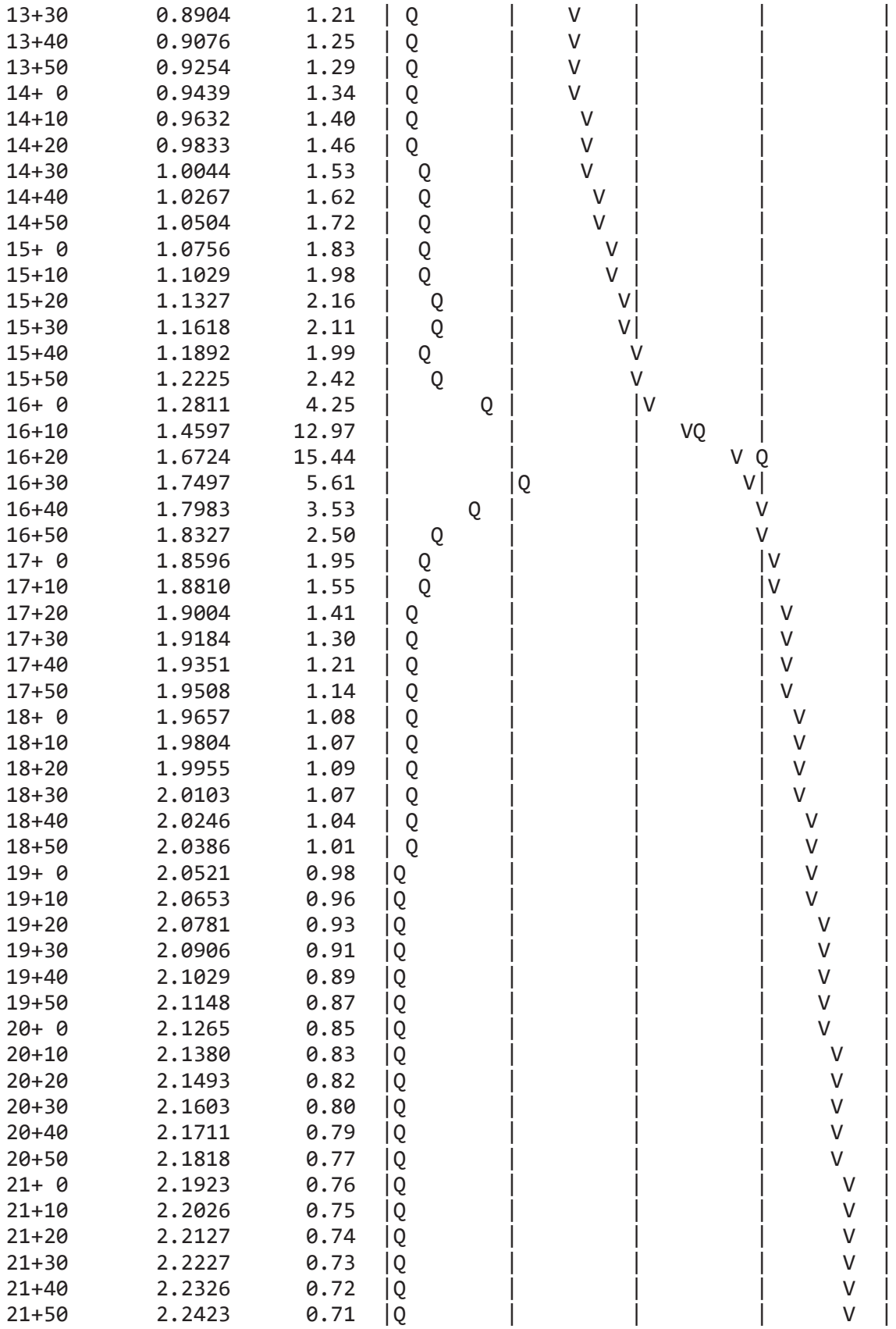
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+10	0.0026	0.19	Q	|	|	|	|
0+20	0.0092	0.48	Q	|	|	|	|
0+30	0.0169	0.56	VQ	|	|	|	|
0+40	0.0249	0.59	VQ	|	|	|	|
0+50	0.0332	0.60	VQ	|	|	|	|
1+ 0	0.0416	0.61	VQ	|	|	|	|
1+10	0.0500	0.61	VQ	|	|	|	|
1+20	0.0585	0.61	VQ	|	|	|	|
1+30	0.0670	0.62	|Q	|	|	|	|
1+40	0.0755	0.62	|Q	|	|	|	|
1+50	0.0841	0.62	|Q	|	|	|	|
2+ 0	0.0928	0.63	|Q	|	|	|	|
2+10	0.1015	0.63	|Q	|	|	|	|
2+20	0.1102	0.63	|Q	|	|	|	|
2+30	0.1190	0.64	|QV	|	|	|	|
2+40	0.1279	0.64	|QV	|	|	|	|
2+50	0.1367	0.65	|QV	|	|	|	|
3+ 0	0.1457	0.65	|QV	|	|	|	|
3+10	0.1547	0.65	|QV	|	|	|	|
3+20	0.1637	0.66	|QV	|	|	|	|
3+30	0.1728	0.66	|QV	|	|	|	|
3+40	0.1820	0.67	|Q V	|	|	|	|
3+50	0.1912	0.67	|Q V	|	|	|	|
4+ 0	0.2005	0.67	|Q V	|	|	|	|
4+10	0.2098	0.68	|Q V	|	|	|	|
4+20	0.2192	0.68	|Q V	|	|	|	|
4+30	0.2287	0.69	|Q V	|	|	|	|
4+40	0.2382	0.69	|Q V	|	|	|	|
4+50	0.2478	0.70	|Q V	|	|	|	|

5+ 0	0.2574	0.70	|Q V |	|	|	|
5+10	0.2671	0.71	|Q V |	|	|	|
5+20	0.2769	0.71	|Q V |	|	|	|
5+30	0.2868	0.72	|Q V |	|	|	|
5+40	0.2967	0.72	|Q V |	|	|	|
5+50	0.3067	0.73	|Q V |	|	|	|
6+ 0	0.3168	0.73	|Q V |	|	|	|
6+10	0.3269	0.74	|Q V |	|	|	|
6+20	0.3372	0.74	|Q V |	|	|	|
6+30	0.3475	0.75	|Q V |	|	|	|
6+40	0.3579	0.75	|Q V |	|	|	|
6+50	0.3683	0.76	|Q V |	|	|	|
7+ 0	0.3789	0.77	|Q V |	|	|	|
7+10	0.3896	0.77	|Q V |	|	|	|
7+20	0.4003	0.78	|Q V |	|	|	|
7+30	0.4112	0.79	|Q V |	|	|	|
7+40	0.4221	0.79	|Q V |	|	|	|
7+50	0.4331	0.80	|Q V |	|	|	|
8+ 0	0.4443	0.81	|Q V |	|	|	|
8+10	0.4555	0.82	|Q V |	|	|	|
8+20	0.4669	0.82	|Q V |	|	|	|
8+30	0.4783	0.83	|Q V |	|	|	|
8+40	0.4899	0.84	|Q V |	|	|	|
8+50	0.5016	0.85	|Q V |	|	|	|
9+ 0	0.5135	0.86	|Q V |	|	|	|
9+10	0.5254	0.87	|Q V |	|	|	|
9+20	0.5375	0.88	|Q V|	|	|	|
9+30	0.5497	0.89	|Q V|	|	|	|
9+40	0.5621	0.90	|Q V|	|	|	|
9+50	0.5746	0.91	|Q V|	|	|	|
10+ 0	0.5873	0.92	|Q V|	|	|	|
10+10	0.6001	0.93	|Q V |	|	|	|
10+20	0.6131	0.94	|Q V |	|	|	|
10+30	0.6263	0.96	|Q V |	|	|	|
10+40	0.6396	0.97	|Q V |	|	|	|
10+50	0.6532	0.98	|Q V |	|	|	|
11+ 0	0.6669	1.00	|Q |V |	|	|	|
11+10	0.6809	1.01	| Q |V |	|	|	|
11+20	0.6950	1.03	| Q |V |	|	|	|
11+30	0.7094	1.04	| Q |V |	|	|	|
11+40	0.7240	1.06	| Q | V |	|	|	|
11+50	0.7389	1.08	| Q | V |	|	|	|
12+ 0	0.7541	1.10	| Q | V |	|	|	|
12+10	0.7689	1.08	| Q | V |	|	|	|
12+20	0.7831	1.03	| Q | V |	|	|	|
12+30	0.7973	1.04	| Q | V |	|	|	|
12+40	0.8119	1.05	| Q | V |	|	|	|
12+50	0.8267	1.08	| Q | V |	|	|	|
13+ 0	0.8419	1.11	| Q | V |	|	|	|
13+10	0.8576	1.14	| Q | V |	|	|	|
13+20	0.8737	1.17	| Q | V |	|	|	|



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   22+ 0       2.2519      0.70  |Q        |         |         |       V |
   22+10       2.2614      0.69  |Q        |         |         |       V |
   22+20       2.2707      0.68  |Q        |         |         |       V |
   22+30       2.2799      0.67  |Q        |         |         |       V |
   22+40       2.2890      0.66  |Q        |         |         |       V |
   22+50       2.2980      0.65  |Q        |         |         |       V |
   23+ 0       2.3069      0.65  |Q        |         |         |       V |
   23+10       2.3157      0.64  |Q        |         |         |        V|
   23+20       2.3244      0.63  |Q        |         |         |        V|
   23+30       2.3330      0.62  |Q        |         |         |        V|
   23+40       2.3415      0.62  |Q        |         |         |        V|
   23+50       2.3499      0.61  |Q        |         |         |        V|
   24+ 0       2.3583      0.61  |Q        |         |         |        V|
   24+10       2.3639      0.41  Q         |         |         |        V|
   24+20       2.3655      0.12  Q         |         |         |        V|
   24+30       2.3662      0.04  Q         |         |         |        V|
-------------------------------------------------------------------------
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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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
PRE-PROJECT CONDITION FOR AREA C
HCCII, 11-04-2019

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 10		
109.59	1	0.77
Rainfall data for year 2		
109.59	6	1.08
Rainfall data for year 2		
109.59	24	2.03
Rainfall data for year 100		
109.59	1	1.29

```
------------------------------------------------------------------------
Rainfall data for year 100
          109.59            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
          109.59           24           6.28
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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)
 55.0      75.0        109.59      1.000     0.453    1.000    0.453

Area-averaged adjusted loss rate Fm (In/Hr) =  0.453

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
   109.59   1.000         55.0      75.0       3.33     0.561

Area-averaged catchment yield fraction, Y =  0.561
Area-averaged low loss fraction, Yb =  0.439
User entry of time of concentration  =   0.624 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =     109.59(Ac.)
Catchment Lag time =   0.499 hours
Unit interval =  10.000 minutes
Unit interval percentage of lag time = 33.3868
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.453(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of     109.59(Ac.) (Ref: fig. E-4)

5-minute factor = 0.995     Adjusted rainfall =  0.609(In)
30-minute factor = 0.995    Adjusted rainfall =  1.042(In)
1-hour factor = 0.995       Adjusted rainfall =  1.283(In)
3-hour factor = 0.999       Adjusted rainfall =  2.159(In)
```

6-hour factor = 1.000 Adjusted rainfall = 2.989(In)
24-hour factor = 1.000 Adjusted rainfall = 6.279(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 662.68 (CFS))	
1	2.076	13.757
2	11.935	65.335
3	37.859	171.790
4	57.783	132.032
5	68.437	70.605
6	75.475	46.638
7	80.519	33.421
8	84.291	24.997
9	87.388	20.524
10	89.726	15.492
11	91.596	12.392
12	93.190	10.565
13	94.489	8.610
14	95.588	7.282
15	96.487	5.954
16	97.215	4.825
17	97.779	3.737
18	98.143	2.411
19	98.512	2.446
20	98.913	2.655
21	99.313	2.654
22	99.611	1.977
23	99.820	1.383
24	100.000	1.193

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.7497	0.1408
2	0.9230	0.0763
3	1.0424	0.0555
4	1.1364	0.0446
5	1.2151	0.0378
6	1.2834	0.0331
7	1.3805	0.0476
8	1.4706	0.0442
9	1.5549	0.0415
10	1.6344	0.0392
11	1.7098	0.0372
12	1.7816	0.0355
13	1.8504	0.0340

14	1.9165	0.0327
15	1.9801	0.0315
16	2.0415	0.0304
17	2.1009	0.0295
18	2.1585	0.0286
19	2.2140	0.0276
20	2.2680	0.0268
21	2.3206	0.0261
22	2.3718	0.0255
23	2.4219	0.0249
24	2.4707	0.0243
25	2.5186	0.0238
26	2.5654	0.0233
27	2.6113	0.0228
28	2.6562	0.0224
29	2.7004	0.0220
30	2.7437	0.0216
31	2.7863	0.0212
32	2.8281	0.0208
33	2.8693	0.0205
34	2.9098	0.0202
35	2.9497	0.0199
36	2.9890	0.0196
37	3.0332	0.0220
38	3.0768	0.0217
39	3.1199	0.0215
40	3.1624	0.0212
41	3.2045	0.0210
42	3.2462	0.0208
43	3.2873	0.0205
44	3.3280	0.0203
45	3.3683	0.0201
46	3.4082	0.0199
47	3.4477	0.0197
48	3.4868	0.0195
49	3.5255	0.0193
50	3.5638	0.0191
51	3.6018	0.0190
52	3.6394	0.0188
53	3.6768	0.0186
54	3.7137	0.0185
55	3.7504	0.0183
56	3.7868	0.0181
57	3.8228	0.0180
58	3.8586	0.0178
59	3.8941	0.0177
60	3.9293	0.0176
61	3.9642	0.0174
62	3.9989	0.0173
63	4.0333	0.0172
64	4.0674	0.0170

65	4.1013	0.0169
66	4.1350	0.0168
67	4.1684	0.0167
68	4.2016	0.0166
69	4.2346	0.0165
70	4.2674	0.0163
71	4.2999	0.0162
72	4.3322	0.0161
73	4.3643	0.0160
74	4.3963	0.0159
75	4.4280	0.0158
76	4.4595	0.0157
77	4.4908	0.0156
78	4.5219	0.0155
79	4.5529	0.0155
80	4.5837	0.0154
81	4.6143	0.0153
82	4.6447	0.0152
83	4.6749	0.0151
84	4.7050	0.0150
85	4.7349	0.0149
86	4.7646	0.0149
87	4.7942	0.0148
88	4.8237	0.0147
89	4.8529	0.0146
90	4.8821	0.0145
91	4.9110	0.0145
92	4.9398	0.0144
93	4.9685	0.0143
94	4.9971	0.0143
95	5.0255	0.0142
96	5.0537	0.0141
97	5.0818	0.0140
98	5.1098	0.0140
99	5.1377	0.0139
100	5.1654	0.0138
101	5.1930	0.0138
102	5.2205	0.0137
103	5.2478	0.0137
104	5.2750	0.0136
105	5.3021	0.0135
106	5.3291	0.0135
107	5.3560	0.0134
108	5.3827	0.0134
109	5.4093	0.0133
110	5.4359	0.0132
111	5.4623	0.0132
112	5.4886	0.0131
113	5.5147	0.0131
114	5.5408	0.0130
115	5.5668	0.0130

116	5.5927	0.0129
117	5.6184	0.0129
118	5.6441	0.0128
119	5.6696	0.0128
120	5.6951	0.0127
121	5.7205	0.0127
122	5.7457	0.0126
123	5.7709	0.0126
124	5.7960	0.0125
125	5.8210	0.0125
126	5.8459	0.0124
127	5.8707	0.0124
128	5.8954	0.0123
129	5.9200	0.0123
130	5.9445	0.0123
131	5.9689	0.0122
132	5.9933	0.0122
133	6.0176	0.0121
134	6.0418	0.0121
135	6.0659	0.0120
136	6.0899	0.0120
137	6.1138	0.0120
138	6.1377	0.0119
139	6.1614	0.0119
140	6.1851	0.0118
141	6.2088	0.0118
142	6.2323	0.0118
143	6.2558	0.0117
144	6.2791	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0234	0.0103	0.0131
2	0.0235	0.0103	0.0132
3	0.0236	0.0104	0.0132
4	0.0237	0.0104	0.0133
5	0.0239	0.0105	0.0134
6	0.0240	0.0105	0.0134
7	0.0241	0.0106	0.0135
8	0.0242	0.0106	0.0136
9	0.0244	0.0107	0.0137
10	0.0245	0.0108	0.0137
11	0.0246	0.0108	0.0138
12	0.0248	0.0109	0.0139
13	0.0249	0.0109	0.0140
14	0.0250	0.0110	0.0140
15	0.0252	0.0111	0.0141
16	0.0253	0.0111	0.0142
17	0.0255	0.0112	0.0143

18	0.0256	0.0112	0.0144
19	0.0258	0.0113	0.0144
20	0.0259	0.0114	0.0145
21	0.0261	0.0115	0.0146
22	0.0262	0.0115	0.0147
23	0.0264	0.0116	0.0148
24	0.0266	0.0117	0.0149
25	0.0267	0.0117	0.0150
26	0.0269	0.0118	0.0151
27	0.0271	0.0119	0.0152
28	0.0273	0.0120	0.0153
29	0.0275	0.0121	0.0154
30	0.0277	0.0121	0.0155
31	0.0279	0.0122	0.0156
32	0.0281	0.0123	0.0157
33	0.0283	0.0124	0.0158
34	0.0285	0.0125	0.0160
35	0.0287	0.0126	0.0161
36	0.0289	0.0127	0.0162
37	0.0291	0.0128	0.0163
38	0.0294	0.0129	0.0165
39	0.0296	0.0130	0.0166
40	0.0298	0.0131	0.0167
41	0.0301	0.0132	0.0169
42	0.0303	0.0133	0.0170
43	0.0306	0.0134	0.0172
44	0.0309	0.0136	0.0173
45	0.0311	0.0137	0.0175
46	0.0314	0.0138	0.0176
47	0.0317	0.0139	0.0178
48	0.0320	0.0141	0.0180
49	0.0323	0.0142	0.0181
50	0.0326	0.0143	0.0183
51	0.0330	0.0145	0.0185
52	0.0333	0.0146	0.0187
53	0.0337	0.0148	0.0189
54	0.0340	0.0149	0.0191
55	0.0344	0.0151	0.0193
56	0.0348	0.0153	0.0195
57	0.0352	0.0155	0.0197
58	0.0356	0.0156	0.0200
59	0.0361	0.0158	0.0202
60	0.0365	0.0160	0.0205
61	0.0370	0.0162	0.0207
62	0.0375	0.0165	0.0210
63	0.0380	0.0167	0.0213
64	0.0385	0.0169	0.0216
65	0.0391	0.0172	0.0219
66	0.0397	0.0174	0.0222
67	0.0403	0.0177	0.0226
68	0.0409	0.0180	0.0230

69	0.0416	0.0183	0.0233
70	0.0423	0.0186	0.0237
71	0.0431	0.0189	0.0242
72	0.0439	0.0193	0.0246
73	0.0393	0.0173	0.0220
74	0.0402	0.0177	0.0225
75	0.0412	0.0181	0.0231
76	0.0422	0.0185	0.0237
77	0.0433	0.0190	0.0243
78	0.0446	0.0196	0.0250
79	0.0459	0.0201	0.0257
80	0.0473	0.0208	0.0265
81	0.0489	0.0215	0.0274
82	0.0506	0.0222	0.0284
83	0.0526	0.0231	0.0295
84	0.0547	0.0240	0.0307
85	0.0576	0.0253	0.0323
86	0.0604	0.0265	0.0339
87	0.0636	0.0279	0.0357
88	0.0674	0.0296	0.0378
89	0.0719	0.0316	0.0403
90	0.0774	0.0340	0.0434
91	0.0843	0.0370	0.0473
92	0.0934	0.0410	0.0524
93	0.0683	0.0300	0.0383
94	0.0855	0.0375	0.0479
95	0.1194	0.0524	0.0670
96	0.2377	0.0755	0.1622
97	0.6853	0.0755	0.6098
98	0.0871	0.0383	0.0489
99	0.0938	0.0412	0.0526
100	0.0775	0.0340	0.0435
101	0.0675	0.0296	0.0378
102	0.0604	0.0265	0.0339
103	0.0548	0.0240	0.0307
104	0.0507	0.0222	0.0284
105	0.0473	0.0208	0.0265
106	0.0446	0.0196	0.0250
107	0.0422	0.0185	0.0237
108	0.0402	0.0177	0.0225
109	0.0439	0.0193	0.0246
110	0.0423	0.0186	0.0237
111	0.0409	0.0180	0.0230
112	0.0397	0.0174	0.0223
113	0.0385	0.0169	0.0216
114	0.0375	0.0165	0.0210
115	0.0365	0.0160	0.0205
116	0.0356	0.0156	0.0200
117	0.0348	0.0153	0.0195
118	0.0340	0.0149	0.0191
119	0.0333	0.0146	0.0187

120	0.0326	0.0143	0.0183
121	0.0320	0.0141	0.0180
122	0.0314	0.0138	0.0176
123	0.0309	0.0136	0.0173
124	0.0303	0.0133	0.0170
125	0.0298	0.0131	0.0167
126	0.0294	0.0129	0.0165
127	0.0289	0.0127	0.0162
128	0.0285	0.0125	0.0160
129	0.0281	0.0123	0.0157
130	0.0277	0.0121	0.0155
131	0.0273	0.0120	0.0153
132	0.0269	0.0118	0.0151
133	0.0266	0.0117	0.0149
134	0.0262	0.0115	0.0147
135	0.0259	0.0114	0.0145
136	0.0256	0.0112	0.0144
137	0.0253	0.0111	0.0142
138	0.0250	0.0110	0.0140
139	0.0248	0.0109	0.0139
140	0.0245	0.0108	0.0137
141	0.0242	0.0106	0.0136
142	0.0240	0.0105	0.0134
143	0.0237	0.0104	0.0133
144	0.0235	0.0103	0.0132

Total soil rain loss = 2.50(In)
Total effective rainfall = 3.78(In)
Peak flow rate in flood hydrograph = 143.58(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	50.0	100.0	150.0	200.0
0+10	0.0025	0.18	Q	|	|	|	|
0+20	0.0168	1.04	Q	|	|	|	|
0+30	0.0622	3.30	Q	|	|	|	|
0+40	0.1317	5.04	VQ	|	|	|	|
0+50	0.2143	6.00	VQ	|	|	|	|
1+ 0	0.3057	6.64	VQ	|	|	|	|
1+10	0.4036	7.11	VQ	|	|	|	|
1+20	0.5065	7.47	VQ	|	|	|	|
1+30	0.6137	7.78	VQ	|	|	|	|
1+40	0.7242	8.02	VQ	|	|	|	|
1+50	0.8375	8.23	VQ	|	|	|	|

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 2+ 0       0.9533      8.41  |Q        |         |         |         |
 2+10       1.0713      8.57  |Q        |         |         |         |
 2+20       1.1913      8.71  |Q        |         |         |         |
 2+30       1.3129      8.83  |Q        |         |         |         |
 2+40       1.4361      8.95  |Q        |         |         |         |
 2+50       1.5607      9.04  |Q        |         |         |         |
 3+ 0       1.6864      9.13  |Q        |         |         |         |
 3+10       1.8133      9.21  |QV       |         |         |         |
 3+20       1.9413      9.30  |QV       |         |         |         |
 3+30       2.0706      9.39  |QV       |         |         |         |
 3+40       2.2010      9.47  |QV       |         |         |         |
 3+50       2.3325      9.54  |QV       |         |         |         |
 4+ 0       2.4649      9.62  |QV       |         |         |         |
 4+10       2.5982      9.67  |Q V      |         |         |         |
 4+20       2.7322      9.73  |Q V      |         |         |         |
 4+30       2.8671      9.79  |Q V      |         |         |         |
 4+40       3.0029      9.86  |Q V      |         |         |         |
 4+50       3.1396      9.92  |Q V      |         |         |         |
 5+ 0       3.2771      9.99  |Q V      |         |         |         |
 5+10       3.4155     10.05  | QV      |         |         |         |
 5+20       3.5549     10.12  | Q V     |         |         |         |
 5+30       3.6953     10.19  | Q V     |         |         |         |
 5+40       3.8366     10.26  | Q V     |         |         |         |
 5+50       3.9789     10.33  | Q V     |         |         |         |
 6+ 0       4.1222     10.40  | Q V     |         |         |         |
 6+10       4.2665     10.48  | Q V     |         |         |         |
 6+20       4.4119     10.56  | Q  V    |         |         |         |
 6+30       4.5584     10.64  | Q  V    |         |         |         |
 6+40       4.7060     10.72  | Q  V    |         |         |         |
 6+50       4.8548     10.80  | Q  V    |         |         |         |
 7+ 0       5.0047     10.88  | Q  V    |         |         |         |
 7+10       5.1559     10.97  | Q  V    |         |         |         |
 7+20       5.3082     11.06  | Q   V   |         |         |         |
 7+30       5.4619     11.15  | Q   V   |         |         |         |
 7+40       5.6168     11.25  | Q   V   |         |         |         |
 7+50       5.7730     11.34  | Q   V   |         |         |         |
 8+ 0       5.9306     11.44  | Q   V   |         |         |         |
 8+10       6.0897     11.55  | Q    V  |         |         |         |
 8+20       6.2502     11.65  | Q    V  |         |         |         |
 8+30       6.4121     11.76  | Q    V  |         |         |         |
 8+40       6.5756     11.87  | Q    V  |         |         |         |
 8+50       6.7407     11.99  | Q    V  |         |         |         |
 9+ 0       6.9074     12.10  | Q     V |         |         |         |
 9+10       7.0758     12.23  | Q     V |         |         |         |
 9+20       7.2460     12.35  | Q     V |         |         |         |
 9+30       7.4179     12.48  | Q     V |         |         |         |
 9+40       7.5917     12.62  | Q     V |         |         |         |
 9+50       7.7675     12.76  | Q      V|         |         |         |
10+ 0       7.9452     12.90  | Q      V|         |         |         |
10+10       8.1250     13.05  | Q      V|         |         |         |
10+20       8.3069     13.21  | Q      V|         |         |         |
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10+30	8.4911	13.37	Q V			
10+40	8.6776	13.54	Q V			
10+50	8.8665	13.71	Q V			
11+ 0	9.0579	13.90	Q V			
11+10	9.2519	14.09	Q V			
11+20	9.4487	14.29	Q V			
11+30	9.6484	14.50	Q V			
11+40	9.8510	14.71	Q V			
11+50	10.0569	14.94	Q V			
12+ 0	10.2660	15.18	Q V			
12+10	10.4781	15.40	Q V			
12+20	10.6911	15.46	Q V			
12+30	10.9007	15.22	Q V			
12+40	11.1090	15.12	Q V			
12+50	11.3186	15.22	Q V			
13+ 0	11.5311	15.42	Q V			
13+10	11.7471	15.69	Q V			
13+20	11.9676	16.00	Q V			
13+30	12.1930	16.37	Q V			
13+40	12.4241	16.78	Q V			
13+50	12.6617	17.25	Q V			
14+ 0	12.9064	17.77	Q V			
14+10	13.1592	18.35	Q V			
14+20	13.4211	19.02	Q V			
14+30	13.6938	19.80	Q V			
14+40	13.9785	20.67	Q V			
14+50	14.2766	21.64	Q V			
15+ 0	14.5903	22.77	Q V			
15+10	14.9223	24.10	Q V			
15+20	15.2763	25.70	Q V			
15+30	15.6535	27.39	Q V			
15+40	16.0468	28.55	Q V			
15+50	16.4377	28.38	Q V			
16+ 0	16.8728	31.58	Q V			
16+10	17.5357	48.13	Q V			
16+20	18.7618	89.02	Q V			
16+30	20.7395	143.58	Q V			
16+40	22.3140	114.31	Q V			
16+50	23.3757	77.08	Q V			
17+ 0	24.2116	60.68	Q V			
17+10	24.9027	50.18	Q V			
17+20	25.4927	42.84	Q V			
17+30	26.0142	37.86	Q V			
17+40	26.4689	33.02	Q V			
17+50	26.8767	29.61	Q V			
18+ 0	27.2495	27.06	Q V			
18+10	27.5897	24.70	Q V			
18+20	27.9065	23.00	Q V			
18+30	28.2057	21.72	Q V			
18+40	28.4885	20.53	Q V			
18+50	28.7534	19.23	Q V			

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   19+ 0      29.0008     17.96  |  Q      |         |         |  V      |
   19+10      29.2418     17.49  |  Q      |         |         |  V      |
   19+20      29.4774     17.10  |  Q      |         |         |   V     |
   19+30      29.7057     16.58  |  Q      |         |         |   V     |
   19+40      29.9221     15.71  |  Q      |         |         |   V     |
   19+50      30.1279     14.94  | Q       |         |         |   V     |
   20+ 0      30.3252     14.32  | Q       |         |         |    V    |
   20+10      30.5085     13.30  | Q       |         |         |    V    |
   20+20      30.6872     12.98  | Q       |         |         |    V    |
   20+30      30.8617     12.67  | Q       |         |         |    V    |
   20+40      31.0323     12.39  | Q       |         |         |     V   |
   20+50      31.1994     12.13  | Q       |         |         |     V   |
   21+ 0      31.3631     11.89  | Q       |         |         |     V   |
   21+10      31.5238     11.66  | Q       |         |         |     V   |
   21+20      31.6816     11.45  | Q       |         |         |     V   |
   21+30      31.8366     11.26  | Q       |         |         |     V   |
   21+40      31.9892     11.07  | Q       |         |         |      V  |
   21+50      32.1392     10.90  | Q       |         |         |      V  |
   22+ 0      32.2870     10.73  | Q       |         |         |      V  |
   22+10      32.4325     10.56  | Q       |         |         |      V  |
   22+20      32.5758     10.41  | Q       |         |         |      V  |
   22+30      32.7172     10.26  | Q       |         |         |      V  |
   22+40      32.8565     10.12  | Q       |         |         |       V |
   22+50      32.9940      9.98  |Q        |         |         |       V |
   23+ 0      33.1297      9.85  |Q        |         |         |       V |
   23+10      33.2637      9.73  |Q        |         |         |       V |
   23+20      33.3961      9.61  |Q        |         |         |       V |
   23+30      33.5269      9.49  |Q        |         |         |       V |
   23+40      33.6561      9.38  |Q        |         |         |        V|
   23+50      33.7839      9.28  |Q        |         |         |        V|
   24+ 0      33.9103      9.17  |Q        |         |         |        V|
   24+10      34.0328      8.90  |Q        |         |         |        V|
   24+20      34.1423      7.95  |Q        |         |         |        V|
   24+30      34.2197      5.62  |Q        |         |         |        V|
-------------------------------------------------------------------------
```

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
PRE-PROJECT CONDITION FOR AREA D
HCCII, 11-04-2019

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 10		
54.89	1	0.77
Rainfall data for year 2		
54.89	6	1.08
Rainfall data for year 2		
54.89	24	2.03
Rainfall data for year 100		
54.89	1	1.29

```
------------------------------------------------------------------------
Rainfall data for year 100
            54.89            6           2.99
------------------------------------------------------------------------
Rainfall data for year 100
            54.89           24           6.28
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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)
 55.0      75.0         54.89      1.000     0.453    1.000    0.453

Area-averaged adjusted loss rate Fm (In/Hr) =  0.453

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
    54.89   1.000         55.0      75.0       3.33     0.561

Area-averaged catchment yield fraction, Y =  0.561
Area-averaged low loss fraction, Yb =  0.439
User entry of time of concentration  =   0.435 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      54.89(Ac.)
Catchment Lag time =   0.348 hours
Unit interval =  10.000 minutes
Unit interval percentage of lag time = 47.8927
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.453(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of      54.89(Ac.) (Ref: fig. E-4)

5-minute factor = 0.997     Adjusted rainfall =  0.611(In)
30-minute factor = 0.997    Adjusted rainfall =  1.045(In)
1-hour factor = 0.997       Adjusted rainfall =  1.287(In)
3-hour factor = 1.000       Adjusted rainfall =  2.159(In)
```

6-hour factor = 1.000 Adjusted rainfall = 2.989(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 331.91 (CFS))	
1	3.690	12.249
2	28.020	80.754
3	58.577	101.421
4	72.297	45.539
5	80.269	26.461
6	85.548	17.521
7	89.340	12.588
8	92.020	8.895
9	94.111	6.940
10	95.699	5.271
11	96.915	4.033
12	97.763	2.815
13	98.297	1.774
14	98.859	1.863
15	99.413	1.840
16	99.765	1.167
17	100.000	0.781

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.7517	0.1411
2	0.9254	0.0765
3	1.0451	0.0556
4	1.1393	0.0447
5	1.2182	0.0379
6	1.2867	0.0332
7	1.3836	0.0475
8	1.4735	0.0441
9	1.5576	0.0414
10	1.6369	0.0391
11	1.7120	0.0371
12	1.7837	0.0354
13	1.8523	0.0339
14	1.9181	0.0326
15	1.9815	0.0314
16	2.0426	0.0303
17	2.1018	0.0294
18	2.1592	0.0285
19	2.2147	0.0276
20	2.2687	0.0268

21	2.3212	0.0261
22	2.3725	0.0255
23	2.4225	0.0249
24	2.4714	0.0243
25	2.5192	0.0238
26	2.5660	0.0233
27	2.6119	0.0228
28	2.6568	0.0224
29	2.7010	0.0220
30	2.7443	0.0216
31	2.7869	0.0212
32	2.8287	0.0208
33	2.8698	0.0205
34	2.9103	0.0202
35	2.9502	0.0199
36	2.9895	0.0196
37	3.0337	0.0220
38	3.0773	0.0217
39	3.1204	0.0215
40	3.1630	0.0212
41	3.2051	0.0210
42	3.2467	0.0208
43	3.2878	0.0205
44	3.3286	0.0203
45	3.3688	0.0201
46	3.4087	0.0199
47	3.4482	0.0197
48	3.4873	0.0195
49	3.5260	0.0193
50	3.5643	0.0191
51	3.6023	0.0190
52	3.6400	0.0188
53	3.6773	0.0186
54	3.7143	0.0185
55	3.7509	0.0183
56	3.7873	0.0181
57	3.8234	0.0180
58	3.8591	0.0178
59	3.8946	0.0177
60	3.9298	0.0176
61	3.9647	0.0174
62	3.9994	0.0173
63	4.0338	0.0172
64	4.0680	0.0170
65	4.1019	0.0169
66	4.1355	0.0168
67	4.1690	0.0167
68	4.2022	0.0166
69	4.2351	0.0165
70	4.2679	0.0163
71	4.3004	0.0162

72	4.3327	0.0161
73	4.3649	0.0160
74	4.3968	0.0159
75	4.4285	0.0158
76	4.4600	0.0157
77	4.4913	0.0156
78	4.5225	0.0155
79	4.5534	0.0155
80	4.5842	0.0154
81	4.6148	0.0153
82	4.6452	0.0152
83	4.6754	0.0151
84	4.7055	0.0150
85	4.7354	0.0149
86	4.7652	0.0149
87	4.7947	0.0148
88	4.8242	0.0147
89	4.8534	0.0146
90	4.8826	0.0145
91	4.9115	0.0145
92	4.9404	0.0144
93	4.9690	0.0143
94	4.9976	0.0142
95	5.0260	0.0142
96	5.0542	0.0141
97	5.0823	0.0140
98	5.1103	0.0140
99	5.1382	0.0139
100	5.1659	0.0138
101	5.1935	0.0138
102	5.2209	0.0137
103	5.2483	0.0137
104	5.2755	0.0136
105	5.3026	0.0135
106	5.3296	0.0135
107	5.3564	0.0134
108	5.3832	0.0134
109	5.4098	0.0133
110	5.4363	0.0132
111	5.4627	0.0132
112	5.4890	0.0131
113	5.5152	0.0131
114	5.5413	0.0130
115	5.5673	0.0130
116	5.5931	0.0129
117	5.6189	0.0129
118	5.6446	0.0128
119	5.6701	0.0128
120	5.6956	0.0127
121	5.7209	0.0127
122	5.7462	0.0126

123	5.7714	0.0126
124	5.7964	0.0125
125	5.8214	0.0125
126	5.8463	0.0124
127	5.8711	0.0124
128	5.8958	0.0123
129	5.9204	0.0123
130	5.9450	0.0123
131	5.9694	0.0122
132	5.9937	0.0122
133	6.0180	0.0121
134	6.0422	0.0121
135	6.0663	0.0120
136	6.0903	0.0120
137	6.1142	0.0120
138	6.1381	0.0119
139	6.1619	0.0119
140	6.1856	0.0118
141	6.2092	0.0118
142	6.2327	0.0118
143	6.2562	0.0117
144	6.2796	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0234	0.0103	0.0131
2	0.0235	0.0103	0.0132
3	0.0236	0.0104	0.0132
4	0.0237	0.0104	0.0133
5	0.0239	0.0105	0.0134
6	0.0240	0.0105	0.0134
7	0.0241	0.0106	0.0135
8	0.0242	0.0106	0.0136
9	0.0244	0.0107	0.0137
10	0.0245	0.0108	0.0137
11	0.0246	0.0108	0.0138
12	0.0248	0.0109	0.0139
13	0.0249	0.0109	0.0140
14	0.0250	0.0110	0.0140
15	0.0252	0.0111	0.0141
16	0.0253	0.0111	0.0142
17	0.0255	0.0112	0.0143
18	0.0256	0.0112	0.0144
19	0.0258	0.0113	0.0144
20	0.0259	0.0114	0.0145
21	0.0261	0.0115	0.0146
22	0.0262	0.0115	0.0147
23	0.0264	0.0116	0.0148
24	0.0266	0.0117	0.0149

25	0.0267	0.0117	0.0150
26	0.0269	0.0118	0.0151
27	0.0271	0.0119	0.0152
28	0.0273	0.0120	0.0153
29	0.0275	0.0121	0.0154
30	0.0277	0.0121	0.0155
31	0.0279	0.0122	0.0156
32	0.0281	0.0123	0.0157
33	0.0283	0.0124	0.0158
34	0.0285	0.0125	0.0160
35	0.0287	0.0126	0.0161
36	0.0289	0.0127	0.0162
37	0.0291	0.0128	0.0163
38	0.0293	0.0129	0.0165
39	0.0296	0.0130	0.0166
40	0.0298	0.0131	0.0167
41	0.0301	0.0132	0.0169
42	0.0303	0.0133	0.0170
43	0.0306	0.0134	0.0172
44	0.0309	0.0136	0.0173
45	0.0311	0.0137	0.0175
46	0.0314	0.0138	0.0176
47	0.0317	0.0139	0.0178
48	0.0320	0.0141	0.0180
49	0.0323	0.0142	0.0181
50	0.0326	0.0143	0.0183
51	0.0330	0.0145	0.0185
52	0.0333	0.0146	0.0187
53	0.0337	0.0148	0.0189
54	0.0340	0.0149	0.0191
55	0.0344	0.0151	0.0193
56	0.0348	0.0153	0.0195
57	0.0352	0.0155	0.0197
58	0.0356	0.0156	0.0200
59	0.0361	0.0158	0.0202
60	0.0365	0.0160	0.0205
61	0.0370	0.0162	0.0207
62	0.0375	0.0165	0.0210
63	0.0380	0.0167	0.0213
64	0.0385	0.0169	0.0216
65	0.0391	0.0172	0.0219
66	0.0397	0.0174	0.0222
67	0.0403	0.0177	0.0226
68	0.0409	0.0180	0.0230
69	0.0416	0.0183	0.0233
70	0.0423	0.0186	0.0237
71	0.0431	0.0189	0.0242
72	0.0439	0.0193	0.0246
73	0.0393	0.0172	0.0220
74	0.0402	0.0176	0.0225
75	0.0412	0.0181	0.0231

76	0.0422	0.0185	0.0237
77	0.0433	0.0190	0.0243
78	0.0445	0.0196	0.0250
79	0.0459	0.0201	0.0257
80	0.0473	0.0208	0.0265
81	0.0489	0.0215	0.0274
82	0.0506	0.0222	0.0284
83	0.0526	0.0231	0.0295
84	0.0547	0.0240	0.0307
85	0.0574	0.0252	0.0322
86	0.0602	0.0264	0.0337
87	0.0634	0.0278	0.0355
88	0.0672	0.0295	0.0377
89	0.0717	0.0315	0.0402
90	0.0772	0.0339	0.0433
91	0.0841	0.0369	0.0472
92	0.0932	0.0409	0.0523
93	0.0685	0.0301	0.0384
94	0.0857	0.0376	0.0481
95	0.1197	0.0526	0.0671
96	0.2383	0.0755	0.1629
97	0.6871	0.0755	0.6116
98	0.0874	0.0384	0.0490
99	0.0936	0.0411	0.0525
100	0.0773	0.0340	0.0434
101	0.0672	0.0295	0.0377
102	0.0602	0.0264	0.0338
103	0.0547	0.0240	0.0307
104	0.0506	0.0222	0.0284
105	0.0473	0.0208	0.0265
106	0.0446	0.0196	0.0250
107	0.0422	0.0185	0.0237
108	0.0402	0.0176	0.0225
109	0.0439	0.0193	0.0246
110	0.0423	0.0186	0.0237
111	0.0409	0.0180	0.0230
112	0.0397	0.0174	0.0223
113	0.0385	0.0169	0.0216
114	0.0375	0.0165	0.0210
115	0.0365	0.0160	0.0205
116	0.0356	0.0156	0.0200
117	0.0348	0.0153	0.0195
118	0.0340	0.0149	0.0191
119	0.0333	0.0146	0.0187
120	0.0326	0.0143	0.0183
121	0.0320	0.0141	0.0180
122	0.0314	0.0138	0.0176
123	0.0309	0.0136	0.0173
124	0.0303	0.0133	0.0170
125	0.0298	0.0131	0.0167
126	0.0294	0.0129	0.0165

127	0.0289	0.0127	0.0162
128	0.0285	0.0125	0.0160
129	0.0281	0.0123	0.0157
130	0.0277	0.0121	0.0155
131	0.0273	0.0120	0.0153
132	0.0269	0.0118	0.0151
133	0.0266	0.0117	0.0149
134	0.0262	0.0115	0.0147
135	0.0259	0.0114	0.0145
136	0.0256	0.0112	0.0144
137	0.0253	0.0111	0.0142
138	0.0250	0.0110	0.0140
139	0.0248	0.0109	0.0139
140	0.0245	0.0108	0.0137
141	0.0242	0.0106	0.0136
142	0.0240	0.0105	0.0134
143	0.0237	0.0104	0.0133
144	0.0235	0.0103	0.0132

Total soil rain loss = 2.50(In)
Total effective rainfall = 3.78(In)
Peak flow rate in flood hydrograph = 78.68(CFS)

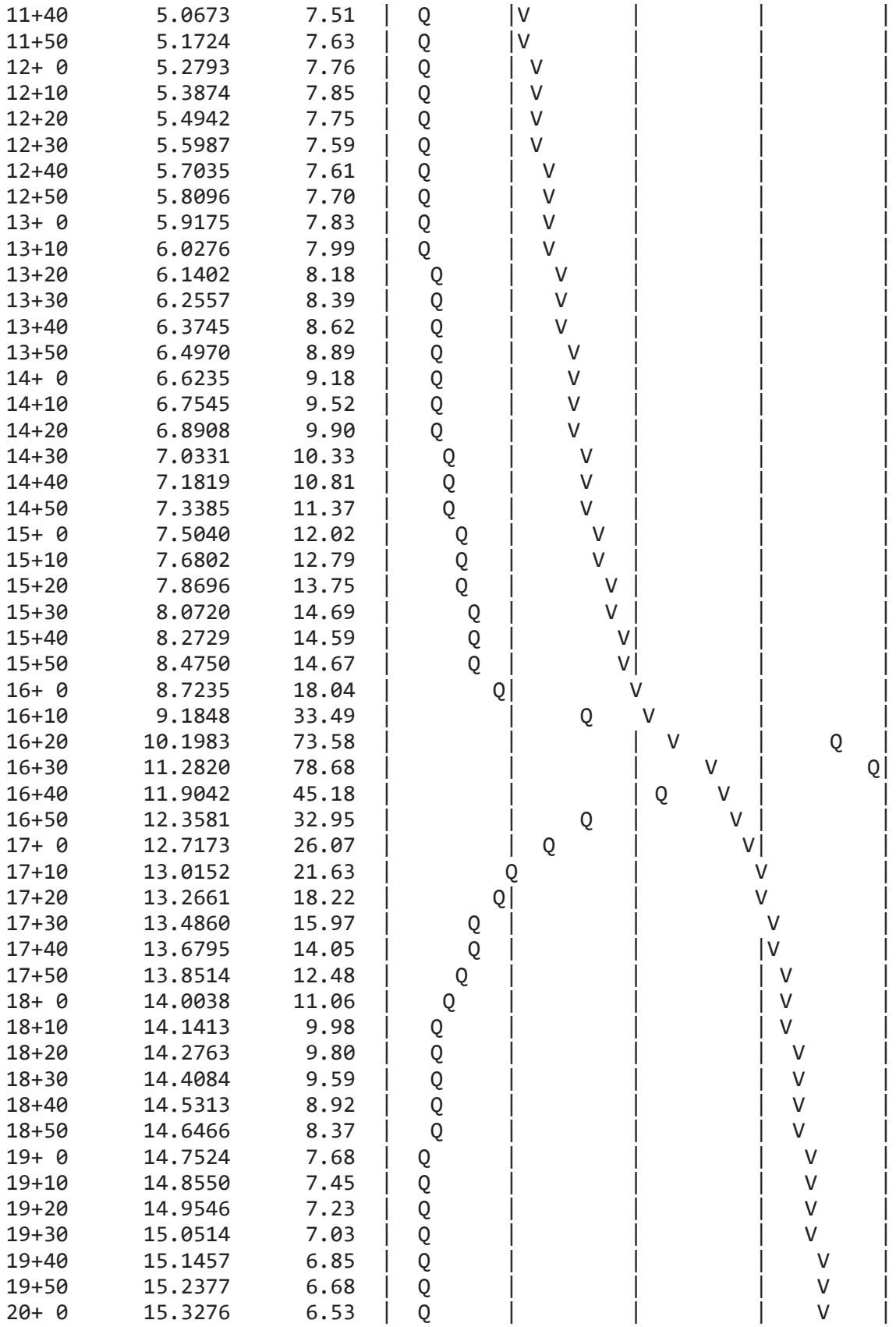
++

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 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	20.0	40.0	60.0	80.0
0+10	0.0022	0.16	Q	|	|	|	|
0+20	0.0190	1.22	Q	|	|	|	|
0+30	0.0542	2.56	VQ	|	|	|	|
0+40	0.0979	3.17	VQ	|	|	|	|
0+50	0.1465	3.53	VQ	|	|	|	|
1+ 0	0.1985	3.78	VQ	|	|	|	|
1+10	0.2530	3.96	VQ	|	|	|	|
1+20	0.3095	4.10	V Q	|	|	|	|
1+30	0.3675	4.21	V Q	|	|	|	|
1+40	0.4267	4.30	V Q	|	|	|	|
1+50	0.4870	4.38	|VQ	|	|	|	|
2+ 0	0.5481	4.44	|VQ	|	|	|	|
2+10	0.6098	4.48	|VQ	|	|	|	|
2+20	0.6723	4.53	|VQ	|	|	|	|
2+30	0.7353	4.58	|VQ	|	|	|	|
2+40	0.7990	4.62	|VQ	|	|	|	|
2+50	0.8632	4.66	|VQ	|	|	|	|
3+ 0	0.9277	4.68	| Q	|	|	|	|

3+10	0.9926	4.71	Q				
3+20	1.0578	4.74	Q				
3+30	1.1235	4.77	Q				
3+40	1.1895	4.79	Q				
3+50	1.2560	4.82	Q				
4+ 0	1.3228	4.85	QV				
4+10	1.3901	4.88	QV				
4+20	1.4578	4.91	QV				
4+30	1.5259	4.95	QV				
4+40	1.5945	4.98	QV				
4+50	1.6635	5.01	QV				
5+ 0	1.7329	5.04	Q V				
5+10	1.8029	5.08	Q V				
5+20	1.8733	5.11	Q V				
5+30	1.9442	5.15	Q V				
5+40	2.0156	5.18	Q V				
5+50	2.0875	5.22	Q V				
6+ 0	2.1599	5.26	Q V				
6+10	2.2329	5.30	Q V				
6+20	2.3064	5.34	Q V				
6+30	2.3805	5.38	Q V				
6+40	2.4552	5.42	Q V				
6+50	2.5304	5.46	Q V				
7+ 0	2.6063	5.51	Q V				
7+10	2.6827	5.55	Q V				
7+20	2.7599	5.60	Q V				
7+30	2.8376	5.65	Q V				
7+40	2.9160	5.69	Q V				
7+50	2.9952	5.74	Q V				
8+ 0	3.0750	5.80	Q V				
8+10	3.1556	5.85	Q V				
8+20	3.2369	5.90	Q V				
8+30	3.3190	5.96	Q V				
8+40	3.4018	6.02	Q V				
8+50	3.4855	6.08	Q V				
9+ 0	3.5701	6.14	Q V				
9+10	3.6555	6.20	Q V				
9+20	3.7419	6.27	Q V				
9+30	3.8291	6.34	Q V				
9+40	3.9174	6.41	Q V				
9+50	4.0066	6.48	Q V				
10+ 0	4.0969	6.56	Q V				
10+10	4.1883	6.63	Q V				
10+20	4.2808	6.72	Q V				
10+30	4.3744	6.80	Q V				
10+40	4.4693	6.89	Q V				
10+50	4.5655	6.98	Q V				
11+ 0	4.6629	7.08	Q V				
11+10	4.7618	7.18	Q V				
11+20	4.8621	7.28	Q V				
11+30	4.9639	7.39	Q V				



```
   20+10      15.4155      6.38  |  Q      |         |         |    V    |
   20+20      15.5015      6.24  |  Q      |         |         |    V    |
   20+30      15.5858      6.12  |  Q      |         |         |     V   |
   20+40      15.6685      6.00  |  Q      |         |         |     V   |
   20+50      15.7496      5.89  | Q       |         |         |     V   |
   21+ 0      15.8292      5.78  | Q       |         |         |     V   |
   21+10      15.9074      5.68  | Q       |         |         |     V   |
   21+20      15.9843      5.58  | Q       |         |         |      V  |
   21+30      16.0599      5.49  | Q       |         |         |      V  |
   21+40      16.1344      5.40  | Q       |         |         |      V  |
   21+50      16.2077      5.32  | Q       |         |         |      V  |
   22+ 0      16.2799      5.24  | Q       |         |         |      V  |
   22+10      16.3511      5.17  | Q       |         |         |      V  |
   22+20      16.4213      5.10  | Q       |         |         |       V |
   22+30      16.4906      5.03  | Q       |         |         |       V |
   22+40      16.5590      4.96  | Q       |         |         |       V |
   22+50      16.6265      4.90  | Q       |         |         |       V |
   23+ 0      16.6931      4.84  | Q       |         |         |       V |
   23+10      16.7590      4.78  | Q       |         |         |       V |
   23+20      16.8241      4.73  | Q       |         |         |       V |
   23+30      16.8884      4.67  | Q       |         |         |        V|
   23+40      16.9521      4.62  | Q       |         |         |        V|
   23+50      17.0150      4.57  | Q       |         |         |        V|
   24+ 0      17.0773      4.52  | Q       |         |         |        V|
   24+10      17.1367      4.31  | Q       |         |         |        V|
   24+20      17.1810      3.22  |Q        |         |         |        V|
   24+30      17.2066      1.86  Q         |         |         |        V|
-------------------------------------------------------------------------
```

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
PRE-PROJECT CONDITION FOR AREA E
HCCII, 11-04-2019

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 10		
8.64	1	0.77
Rainfall data for year 2		
8.64	6	1.08
Rainfall data for year 2		
8.64	24	2.03
Rainfall data for year 100		
8.64	1	1.29

```
------------------------------------------------------------------
Rainfall data for year 100
            8.64            6           2.99
------------------------------------------------------------------
Rainfall data for year 100
            8.64           24           6.28
------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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)
 55.0      75.0          8.64      1.000     0.453    1.000    0.453

Area-averaged adjusted loss rate Fm (In/Hr) =  0.453

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
     8.64   1.000         55.0      75.0       3.33     0.561

Area-averaged catchment yield fraction, Y =  0.561
Area-averaged low loss fraction, Yb =  0.439
User entry of time of concentration  =   0.294 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =       8.64(Ac.)
Catchment Lag time =   0.235 hours
Unit interval =  10.000 minutes
Unit interval percentage of lag time = 70.9582
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.453(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of       8.64(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000     Adjusted rainfall =  0.612(In)
30-minute factor = 1.000    Adjusted rainfall =  1.047(In)
1-hour factor = 1.000       Adjusted rainfall =  1.289(In)
3-hour factor = 1.000       Adjusted rainfall =  2.160(In)
```

6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 52.25 (CFS))	
1	8.068	4.215
2	51.217	22.543
3	74.028	11.917
4	83.992	5.206
5	89.796	3.032
6	93.414	1.890
7	95.859	1.277
8	97.461	0.837
9	98.352	0.466
10	99.186	0.435
11	100.000	0.426

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.7533	0.1414
2	0.9274	0.0767
3	1.0474	0.0557
4	1.1418	0.0448
5	1.2208	0.0380
6	1.2895	0.0332
7	1.3863	0.0474
8	1.4759	0.0441
9	1.5599	0.0413
10	1.6390	0.0390
11	1.7140	0.0370
12	1.7854	0.0353
13	1.8538	0.0338
14	1.9194	0.0325
15	1.9826	0.0313
16	2.0436	0.0302
17	2.1026	0.0293
18	2.1598	0.0284
19	2.2153	0.0275
20	2.2693	0.0268
21	2.3218	0.0261
22	2.3731	0.0255
23	2.4231	0.0249
24	2.4719	0.0243
25	2.5197	0.0238
26	2.5665	0.0233

27	2.6124	0.0228
28	2.6574	0.0224
29	2.7015	0.0220
30	2.7448	0.0216
31	2.7873	0.0212
32	2.8292	0.0208
33	2.8703	0.0205
34	2.9108	0.0202
35	2.9507	0.0199
36	2.9899	0.0196
37	3.0341	0.0220
38	3.0777	0.0217
39	3.1208	0.0215
40	3.1634	0.0212
41	3.2055	0.0210
42	3.2471	0.0208
43	3.2883	0.0205
44	3.3290	0.0203
45	3.3693	0.0201
46	3.4092	0.0199
47	3.4486	0.0197
48	3.4877	0.0195
49	3.5264	0.0193
50	3.5648	0.0191
51	3.6028	0.0190
52	3.6404	0.0188
53	3.6777	0.0186
54	3.7147	0.0185
55	3.7514	0.0183
56	3.7877	0.0181
57	3.8238	0.0180
58	3.8596	0.0178
59	3.8950	0.0177
60	3.9302	0.0176
61	3.9652	0.0174
62	3.9998	0.0173
63	4.0343	0.0172
64	4.0684	0.0170
65	4.1023	0.0169
66	4.1360	0.0168
67	4.1694	0.0167
68	4.2026	0.0166
69	4.2356	0.0165
70	4.2683	0.0163
71	4.3009	0.0162
72	4.3332	0.0161
73	4.3653	0.0160
74	4.3972	0.0159
75	4.4289	0.0158
76	4.4604	0.0157
77	4.4918	0.0156

78	4.5229	0.0155
79	4.5538	0.0155
80	4.5846	0.0154
81	4.6152	0.0153
82	4.6456	0.0152
83	4.6759	0.0151
84	4.7059	0.0150
85	4.7358	0.0149
86	4.7656	0.0149
87	4.7952	0.0148
88	4.8246	0.0147
89	4.8539	0.0146
90	4.8830	0.0145
91	4.9120	0.0145
92	4.9408	0.0144
93	4.9695	0.0143
94	4.9980	0.0142
95	5.0264	0.0142
96	5.0546	0.0141
97	5.0828	0.0140
98	5.1107	0.0140
99	5.1386	0.0139
100	5.1663	0.0138
101	5.1939	0.0138
102	5.2214	0.0137
103	5.2487	0.0137
104	5.2759	0.0136
105	5.3030	0.0135
106	5.3300	0.0135
107	5.3569	0.0134
108	5.3836	0.0134
109	5.4102	0.0133
110	5.4367	0.0132
111	5.4631	0.0132
112	5.4894	0.0131
113	5.5156	0.0131
114	5.5417	0.0130
115	5.5677	0.0130
116	5.5935	0.0129
117	5.6193	0.0129
118	5.6450	0.0128
119	5.6705	0.0128
120	5.6960	0.0127
121	5.7213	0.0127
122	5.7466	0.0126
123	5.7718	0.0126
124	5.7968	0.0125
125	5.8218	0.0125
126	5.8467	0.0124
127	5.8715	0.0124
128	5.8962	0.0123

129	5.9208	0.0123	
130	5.9453	0.0123	
131	5.9698	0.0122	
132	5.9941	0.0122	
133	6.0184	0.0121	
134	6.0426	0.0121	
135	6.0667	0.0120	
136	6.0907	0.0120	
137	6.1146	0.0120	
138	6.1385	0.0119	
139	6.1622	0.0119	
140	6.1859	0.0118	
141	6.2096	0.0118	
142	6.2331	0.0118	
143	6.2565	0.0117	
144	6.2799	0.0117	

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0234	0.0103	0.0131
2	0.0235	0.0103	0.0132
3	0.0236	0.0104	0.0132
4	0.0237	0.0104	0.0133
5	0.0239	0.0105	0.0134
6	0.0240	0.0105	0.0134
7	0.0241	0.0106	0.0135
8	0.0242	0.0106	0.0136
9	0.0244	0.0107	0.0137
10	0.0245	0.0108	0.0137
11	0.0246	0.0108	0.0138
12	0.0247	0.0109	0.0139
13	0.0249	0.0109	0.0140
14	0.0250	0.0110	0.0140
15	0.0252	0.0111	0.0141
16	0.0253	0.0111	0.0142
17	0.0255	0.0112	0.0143
18	0.0256	0.0112	0.0144
19	0.0258	0.0113	0.0144
20	0.0259	0.0114	0.0145
21	0.0261	0.0115	0.0146
22	0.0262	0.0115	0.0147
23	0.0264	0.0116	0.0148
24	0.0266	0.0117	0.0149
25	0.0267	0.0117	0.0150
26	0.0269	0.0118	0.0151
27	0.0271	0.0119	0.0152
28	0.0273	0.0120	0.0153
29	0.0275	0.0121	0.0154
30	0.0277	0.0121	0.0155

31	0.0279	0.0122	0.0156
32	0.0281	0.0123	0.0157
33	0.0283	0.0124	0.0158
34	0.0285	0.0125	0.0160
35	0.0287	0.0126	0.0161
36	0.0289	0.0127	0.0162
37	0.0291	0.0128	0.0163
38	0.0293	0.0129	0.0165
39	0.0296	0.0130	0.0166
40	0.0298	0.0131	0.0167
41	0.0301	0.0132	0.0169
42	0.0303	0.0133	0.0170
43	0.0306	0.0134	0.0172
44	0.0309	0.0136	0.0173
45	0.0311	0.0137	0.0175
46	0.0314	0.0138	0.0176
47	0.0317	0.0139	0.0178
48	0.0320	0.0141	0.0180
49	0.0323	0.0142	0.0181
50	0.0326	0.0143	0.0183
51	0.0330	0.0145	0.0185
52	0.0333	0.0146	0.0187
53	0.0337	0.0148	0.0189
54	0.0340	0.0149	0.0191
55	0.0344	0.0151	0.0193
56	0.0348	0.0153	0.0195
57	0.0352	0.0155	0.0197
58	0.0356	0.0156	0.0200
59	0.0361	0.0158	0.0202
60	0.0365	0.0160	0.0205
61	0.0370	0.0162	0.0207
62	0.0375	0.0165	0.0210
63	0.0380	0.0167	0.0213
64	0.0385	0.0169	0.0216
65	0.0391	0.0172	0.0219
66	0.0397	0.0174	0.0223
67	0.0403	0.0177	0.0226
68	0.0409	0.0180	0.0230
69	0.0416	0.0183	0.0233
70	0.0423	0.0186	0.0237
71	0.0431	0.0189	0.0242
72	0.0439	0.0193	0.0246
73	0.0393	0.0172	0.0220
74	0.0402	0.0176	0.0225
75	0.0411	0.0181	0.0231
76	0.0422	0.0185	0.0237
77	0.0433	0.0190	0.0243
78	0.0445	0.0196	0.0250
79	0.0459	0.0201	0.0257
80	0.0473	0.0208	0.0265
81	0.0489	0.0215	0.0274

82	0.0506	0.0222	0.0284
83	0.0525	0.0231	0.0295
84	0.0547	0.0240	0.0307
85	0.0572	0.0251	0.0321
86	0.0600	0.0263	0.0336
87	0.0632	0.0278	0.0354
88	0.0670	0.0294	0.0376
89	0.0715	0.0314	0.0401
90	0.0770	0.0338	0.0432
91	0.0839	0.0369	0.0471
92	0.0930	0.0409	0.0522
93	0.0686	0.0301	0.0385
94	0.0859	0.0377	0.0482
95	0.1200	0.0527	0.0673
96	0.2389	0.0755	0.1634
97	0.6886	0.0755	0.6131
98	0.0876	0.0385	0.0491
99	0.0934	0.0410	0.0524
100	0.0771	0.0339	0.0433
101	0.0670	0.0294	0.0376
102	0.0600	0.0264	0.0337
103	0.0547	0.0240	0.0307
104	0.0506	0.0222	0.0284
105	0.0473	0.0208	0.0265
106	0.0445	0.0196	0.0250
107	0.0422	0.0185	0.0237
108	0.0402	0.0176	0.0225
109	0.0439	0.0193	0.0246
110	0.0423	0.0186	0.0237
111	0.0409	0.0180	0.0230
112	0.0397	0.0174	0.0223
113	0.0385	0.0169	0.0216
114	0.0375	0.0165	0.0210
115	0.0365	0.0160	0.0205
116	0.0356	0.0156	0.0200
117	0.0348	0.0153	0.0195
118	0.0340	0.0149	0.0191
119	0.0333	0.0146	0.0187
120	0.0326	0.0143	0.0183
121	0.0320	0.0141	0.0180
122	0.0314	0.0138	0.0176
123	0.0309	0.0136	0.0173
124	0.0303	0.0133	0.0170
125	0.0298	0.0131	0.0167
126	0.0293	0.0129	0.0165
127	0.0289	0.0127	0.0162
128	0.0285	0.0125	0.0160
129	0.0281	0.0123	0.0157
130	0.0277	0.0121	0.0155
131	0.0273	0.0120	0.0153
132	0.0269	0.0118	0.0151

133	0.0266	0.0117	0.0149
134	0.0262	0.0115	0.0147
135	0.0259	0.0114	0.0145
136	0.0256	0.0112	0.0144
137	0.0253	0.0111	0.0142
138	0.0250	0.0110	0.0140
139	0.0247	0.0109	0.0139
140	0.0245	0.0108	0.0137
141	0.0242	0.0106	0.0136
142	0.0240	0.0105	0.0134
143	0.0237	0.0104	0.0133
144	0.0235	0.0103	0.0132

Total soil rain loss = 2.50(In)
Total effective rainfall = 3.78(In)
Peak flow rate in flood hydrograph = 16.70(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 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+10	0.0008	0.06	Q	|	|	|	|
0+20	0.0056	0.35	Q	|	|	|	|
0+30	0.0126	0.51	VQ	|	|	|	|
0+40	0.0206	0.58	VQ	|	|	|	|
0+50	0.0292	0.62	VQ	|	|	|	|
1+ 0	0.0381	0.65	VQ	|	|	|	|
1+10	0.0474	0.67	VQ	|	|	|	|
1+20	0.0568	0.68	VQ	|	|	|	|
1+30	0.0664	0.69	VQ	|	|	|	|
1+40	0.0761	0.70	|Q	|	|	|	|
1+50	0.0859	0.71	|Q	|	|	|	|
2+ 0	0.0958	0.72	|Q	|	|	|	|
2+10	0.1057	0.72	|Q	|	|	|	|
2+20	0.1157	0.72	|Q	|	|	|	|
2+30	0.1257	0.73	|Q	|	|	|	|
2+40	0.1358	0.73	|Q	|	|	|	|
2+50	0.1460	0.74	|QV	|	|	|	|
3+ 0	0.1562	0.74	|QV	|	|	|	|
3+10	0.1665	0.75	|QV	|	|	|	|
3+20	0.1768	0.75	|QV	|	|	|	|
3+30	0.1872	0.75	|QV	|	|	|	|
3+40	0.1976	0.76	|QV	|	|	|	|
3+50	0.2082	0.76	|Q V	|	|	|	|
4+ 0	0.2188	0.77	|Q V	|	|	|	|

4+10	0.2294	0.77	Q V			
4+20	0.2401	0.78	Q V			
4+30	0.2509	0.78	Q V			
4+40	0.2618	0.79	Q V			
4+50	0.2727	0.79	Q V			
5+ 0	0.2837	0.80	Q V			
5+10	0.2948	0.80	Q V			
5+20	0.3059	0.81	Q V			
5+30	0.3172	0.82	Q V			
5+40	0.3285	0.82	Q V			
5+50	0.3399	0.83	Q V			
6+ 0	0.3514	0.83	Q V			
6+10	0.3630	0.84	Q V			
6+20	0.3746	0.85	Q V			
6+30	0.3864	0.85	Q V			
6+40	0.3982	0.86	Q V			
6+50	0.4101	0.87	Q V			
7+ 0	0.4222	0.87	Q V			
7+10	0.4343	0.88	Q V			
7+20	0.4465	0.89	Q V			
7+30	0.4589	0.90	Q V			
7+40	0.4713	0.90	Q V			
7+50	0.4839	0.91	Q V			
8+ 0	0.4966	0.92	Q V			
8+10	0.5094	0.93	Q V			
8+20	0.5223	0.94	Q V			
8+30	0.5353	0.95	Q V			
8+40	0.5485	0.96	Q V			
8+50	0.5618	0.97	Q V			
9+ 0	0.5752	0.98	Q V			
9+10	0.5888	0.99	Q V			
9+20	0.6025	1.00	Q V			
9+30	0.6164	1.01	Q V			
9+40	0.6305	1.02	Q V			
9+50	0.6447	1.03	Q V			
10+ 0	0.6590	1.04	Q V			
10+10	0.6736	1.06	Q V			
10+20	0.6883	1.07	Q V			
10+30	0.7032	1.08	Q V			
10+40	0.7184	1.10	Q V			
10+50	0.7337	1.11	Q V			
11+ 0	0.7492	1.13	Q V			
11+10	0.7650	1.15	Q V			
11+20	0.7810	1.16	Q V			
11+30	0.7973	1.18	Q V			
11+40	0.8138	1.20	Q V			
11+50	0.8306	1.22	Q V			
12+ 0	0.8477	1.24	Q V			
12+10	0.8649	1.25	Q V			
12+20	0.8815	1.20	Q V			
12+30	0.8979	1.19	Q V			

12+40	0.9145	1.20	Q	V			
12+50	0.9313	1.22	Q	V			
13+ 0	0.9485	1.25	Q	V			
13+10	0.9661	1.28	Q	V			
13+20	0.9841	1.31	Q	V			
13+30	1.0027	1.35	Q	V			
13+40	1.0218	1.39	Q	V			
13+50	1.0416	1.43	Q	V			
14+ 0	1.0621	1.49	Q	V			
14+10	1.0833	1.54	Q	V			
14+20	1.1055	1.61	Q	V			
14+30	1.1287	1.68	Q	V			
14+40	1.1530	1.77	Q	V			
14+50	1.1787	1.86	Q	V			
15+ 0	1.2060	1.98	Q	V			
15+10	1.2352	2.12	Q	V			
15+20	1.2668	2.29	Q	V			
15+30	1.3003	2.43	Q	V			
15+40	1.3315	2.26	Q	V			
15+50	1.3652	2.45	Q	V			
16+ 0	1.4115	3.36	Q	V			
16+10	1.5173	7.68	Q	V			
16+20	1.7474	16.70	Q	V			
16+30	1.8842	9.93	Q	V			
16+40	1.9657	5.92	Q	V			
16+50	2.0259	4.37	Q	V			
17+ 0	2.0729	3.41	Q	V			
17+10	2.1115	2.80	Q	V			
17+20	2.1437	2.34	Q	V			
17+30	2.1710	1.98	Q	V			
17+40	2.1963	1.83	Q	V			
17+50	2.2193	1.67	Q	V			
18+ 0	2.2379	1.35	Q	V			
18+10	2.2556	1.28	Q	V			
18+20	2.2733	1.29	Q	V			
18+30	2.2907	1.26	Q	V			
18+40	2.3076	1.23	Q	V			
18+50	2.3241	1.20	Q	V			
19+ 0	2.3401	1.16	Q	V			
19+10	2.3557	1.13	Q	V			
19+20	2.3709	1.10	Q	V			
19+30	2.3857	1.07	Q	V			
19+40	2.4001	1.05	Q	V			
19+50	2.4143	1.03	Q	V			
20+ 0	2.4281	1.00	Q	V			
20+10	2.4416	0.98	Q	V			
20+20	2.4548	0.96	Q	V			
20+30	2.4678	0.94	Q	V			
20+40	2.4805	0.92	Q	V			
20+50	2.4930	0.91	Q	V			
21+ 0	2.5053	0.89	Q	V			

```
   21+10       2.5174      0.88  |Q        |         |         |      V  |
   21+20       2.5292      0.86  |Q        |         |         |      V  |
   21+30       2.5409      0.85  |Q        |         |         |      V  |
   21+40       2.5524      0.84  |Q        |         |         |      V  |
   21+50       2.5638      0.82  |Q        |         |         |      V  |
   22+ 0       2.5750      0.81  |Q        |         |         |      V  |
   22+10       2.5860      0.80  |Q        |         |         |       V |
   22+20       2.5969      0.79  |Q        |         |         |       V |
   22+30       2.6077      0.78  |Q        |         |         |       V |
   22+40       2.6183      0.77  |Q        |         |         |       V |
   22+50       2.6287      0.76  |Q        |         |         |       V |
   23+ 0       2.6391      0.75  |Q        |         |         |       V |
   23+10       2.6493      0.74  |Q        |         |         |       V |
   23+20       2.6594      0.73  |Q        |         |         |        V|
   23+30       2.6695      0.73  |Q        |         |         |        V|
   23+40       2.6794      0.72  |Q        |         |         |        V|
   23+50       2.6891      0.71  |Q        |         |         |        V|
   24+ 0       2.6988      0.70  |Q        |         |         |        V|
   24+10       2.7077      0.64  |Q        |         |         |        V|
   24+20       2.7124      0.34  Q         |         |         |        V|
   24+30       2.7149      0.18  Q         |         |         |        V|
-------------------------------------------------------------------------
```

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 11/04/19

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

Program License Serial Number 6277

JOB NO. 2019-185
100-YEAR UNIT HYDROGRPAH
PRE-PROJECT CONDITION FOR AREA F
HCCII, 11-04-2019

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 10		
13.47	1	0.77
Rainfall data for year 2		
13.47	6	1.08
Rainfall data for year 2		
13.47	24	2.03
Rainfall data for year 100		
13.47	1	1.29

```
------------------------------------------------------------------
Rainfall data for year 100
           13.47           6           2.99
------------------------------------------------------------------
Rainfall data for year 100
           13.47          24           6.28
------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** 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)
 55.0      75.0         13.47      1.000     0.453    1.000    0.453

Area-averaged adjusted loss rate Fm (In/Hr) =  0.453

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

Area       Area          SCS CN    SCS CN      S     Pervious
 (Ac.)      Fract         (AMC2)    (AMC3)           Yield Fr
    13.47   1.000         55.0      75.0       3.33     0.561

Area-averaged catchment yield fraction, Y =  0.561
Area-averaged low loss fraction, Yb =  0.439
User entry of time of concentration  =   0.274 (hours)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watershed area =      13.47(Ac.)
Catchment Lag time =   0.219 hours
Unit interval =  10.000 minutes
Unit interval percentage of lag time = 76.0341
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.453(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall =  0.612(In)
Computed peak 30-minute rainfall =  1.048(In)
Specified peak 1-hour rainfall =  1.290(In)
Computed peak 3-hour rainfall =  2.160(In)
Specified peak 6-hour rainfall =  2.990(In)
Specified peak 24-hour rainfall =  6.280(In)


Rainfall depth area reduction factors:
Using a total area of      13.47(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999     Adjusted rainfall =  0.612(In)
30-minute factor = 0.999    Adjusted rainfall =  1.047(In)
1-hour factor = 0.999       Adjusted rainfall =  1.289(In)
3-hour factor = 1.000       Adjusted rainfall =  2.160(In)
```

6-hour factor = 1.000 Adjusted rainfall = 2.990(In)
24-hour factor = 1.000 Adjusted rainfall = 6.280(In)

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

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 81.45 (CFS))	
1	9.515	7.750
2	54.852	36.928
3	76.268	17.444
4	85.718	7.697
5	91.101	4.384
6	94.490	2.761
7	96.695	1.796
8	97.987	1.052
9	98.855	0.707
10	99.630	0.631
11	100.000	0.301

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.7531	0.1414
2	0.9272	0.0767
3	1.0471	0.0557
4	1.1415	0.0448
5	1.2206	0.0380
6	1.2892	0.0332
7	1.3860	0.0474
8	1.4757	0.0441
9	1.5596	0.0413
10	1.6387	0.0390
11	1.7138	0.0370
12	1.7853	0.0353
13	1.8536	0.0338
14	1.9193	0.0325
15	1.9825	0.0313
16	2.0435	0.0302
17	2.1025	0.0293
18	2.1598	0.0284
19	2.2152	0.0275
20	2.2692	0.0268
21	2.3218	0.0261
22	2.3730	0.0255
23	2.4230	0.0249
24	2.4719	0.0243
25	2.5197	0.0238
26	2.5665	0.0233

27	2.6123	0.0228
28	2.6573	0.0224
29	2.7014	0.0220
30	2.7447	0.0216
31	2.7873	0.0212
32	2.8291	0.0208
33	2.8703	0.0205
34	2.9108	0.0202
35	2.9506	0.0199
36	2.9899	0.0196
37	3.0341	0.0220
38	3.0777	0.0217
39	3.1208	0.0215
40	3.1634	0.0212
41	3.2054	0.0210
42	3.2471	0.0208
43	3.2882	0.0205
44	3.3289	0.0203
45	3.3692	0.0201
46	3.4091	0.0199
47	3.4486	0.0197
48	3.4877	0.0195
49	3.5264	0.0193
50	3.5647	0.0191
51	3.6027	0.0190
52	3.6404	0.0188
53	3.6777	0.0186
54	3.7147	0.0185
55	3.7513	0.0183
56	3.7877	0.0181
57	3.8238	0.0180
58	3.8595	0.0178
59	3.8950	0.0177
60	3.9302	0.0176
61	3.9651	0.0174
62	3.9998	0.0173
63	4.0342	0.0172
64	4.0684	0.0170
65	4.1023	0.0169
66	4.1359	0.0168
67	4.1694	0.0167
68	4.2026	0.0166
69	4.2355	0.0165
70	4.2683	0.0163
71	4.3008	0.0162
72	4.3331	0.0161
73	4.3653	0.0160
74	4.3972	0.0159
75	4.4289	0.0158
76	4.4604	0.0157
77	4.4917	0.0156

78	4.5228	0.0155
79	4.5538	0.0155
80	4.5846	0.0154
81	4.6152	0.0153
82	4.6456	0.0152
83	4.6758	0.0151
84	4.7059	0.0150
85	4.7358	0.0149
86	4.7655	0.0149
87	4.7951	0.0148
88	4.8245	0.0147
89	4.8538	0.0146
90	4.8829	0.0145
91	4.9119	0.0145
92	4.9407	0.0144
93	4.9694	0.0143
94	4.9979	0.0142
95	5.0263	0.0142
96	5.0546	0.0141
97	5.0827	0.0140
98	5.1107	0.0140
99	5.1385	0.0139
100	5.1663	0.0138
101	5.1939	0.0138
102	5.2213	0.0137
103	5.2487	0.0137
104	5.2759	0.0136
105	5.3030	0.0135
106	5.3300	0.0135
107	5.3568	0.0134
108	5.3836	0.0134
109	5.4102	0.0133
110	5.4367	0.0132
111	5.4631	0.0132
112	5.4894	0.0131
113	5.5156	0.0131
114	5.5417	0.0130
115	5.5676	0.0130
116	5.5935	0.0129
117	5.6192	0.0129
118	5.6449	0.0128
119	5.6705	0.0128
120	5.6959	0.0127
121	5.7213	0.0127
122	5.7466	0.0126
123	5.7717	0.0126
124	5.7968	0.0125
125	5.8218	0.0125
126	5.8467	0.0124
127	5.8715	0.0124
128	5.8962	0.0123

129	5.9208	0.0123
130	5.9453	0.0123
131	5.9697	0.0122
132	5.9941	0.0122
133	6.0184	0.0121
134	6.0425	0.0121
135	6.0666	0.0120
136	6.0906	0.0120
137	6.1146	0.0120
138	6.1384	0.0119
139	6.1622	0.0119
140	6.1859	0.0118
141	6.2095	0.0118
142	6.2331	0.0118
143	6.2565	0.0117
144	6.2799	0.0117

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0234	0.0103	0.0131
2	0.0235	0.0103	0.0132
3	0.0236	0.0104	0.0132
4	0.0237	0.0104	0.0133
5	0.0239	0.0105	0.0134
6	0.0240	0.0105	0.0134
7	0.0241	0.0106	0.0135
8	0.0242	0.0106	0.0136
9	0.0244	0.0107	0.0137
10	0.0245	0.0108	0.0137
11	0.0246	0.0108	0.0138
12	0.0247	0.0109	0.0139
13	0.0249	0.0109	0.0140
14	0.0250	0.0110	0.0140
15	0.0252	0.0111	0.0141
16	0.0253	0.0111	0.0142
17	0.0255	0.0112	0.0143
18	0.0256	0.0112	0.0144
19	0.0258	0.0113	0.0144
20	0.0259	0.0114	0.0145
21	0.0261	0.0115	0.0146
22	0.0262	0.0115	0.0147
23	0.0264	0.0116	0.0148
24	0.0266	0.0117	0.0149
25	0.0267	0.0117	0.0150
26	0.0269	0.0118	0.0151
27	0.0271	0.0119	0.0152
28	0.0273	0.0120	0.0153
29	0.0275	0.0121	0.0154
30	0.0277	0.0121	0.0155

31	0.0279	0.0122	0.0156
32	0.0281	0.0123	0.0157
33	0.0283	0.0124	0.0158
34	0.0285	0.0125	0.0160
35	0.0287	0.0126	0.0161
36	0.0289	0.0127	0.0162
37	0.0291	0.0128	0.0163
38	0.0293	0.0129	0.0165
39	0.0296	0.0130	0.0166
40	0.0298	0.0131	0.0167
41	0.0301	0.0132	0.0169
42	0.0303	0.0133	0.0170
43	0.0306	0.0134	0.0172
44	0.0309	0.0136	0.0173
45	0.0311	0.0137	0.0175
46	0.0314	0.0138	0.0176
47	0.0317	0.0139	0.0178
48	0.0320	0.0141	0.0180
49	0.0323	0.0142	0.0181
50	0.0326	0.0143	0.0183
51	0.0330	0.0145	0.0185
52	0.0333	0.0146	0.0187
53	0.0337	0.0148	0.0189
54	0.0340	0.0149	0.0191
55	0.0344	0.0151	0.0193
56	0.0348	0.0153	0.0195
57	0.0352	0.0155	0.0197
58	0.0356	0.0156	0.0200
59	0.0361	0.0158	0.0202
60	0.0365	0.0160	0.0205
61	0.0370	0.0162	0.0207
62	0.0375	0.0165	0.0210
63	0.0380	0.0167	0.0213
64	0.0385	0.0169	0.0216
65	0.0391	0.0172	0.0219
66	0.0397	0.0174	0.0222
67	0.0403	0.0177	0.0226
68	0.0409	0.0180	0.0230
69	0.0416	0.0183	0.0233
70	0.0423	0.0186	0.0237
71	0.0431	0.0189	0.0242
72	0.0439	0.0193	0.0246
73	0.0393	0.0172	0.0220
74	0.0402	0.0176	0.0225
75	0.0411	0.0181	0.0231
76	0.0422	0.0185	0.0237
77	0.0433	0.0190	0.0243
78	0.0445	0.0196	0.0250
79	0.0459	0.0201	0.0257
80	0.0473	0.0208	0.0265
81	0.0489	0.0215	0.0274

82	0.0506	0.0222	0.0284
83	0.0525	0.0231	0.0295
84	0.0547	0.0240	0.0307
85	0.0572	0.0251	0.0321
86	0.0600	0.0263	0.0336
87	0.0632	0.0278	0.0354
88	0.0670	0.0294	0.0376
89	0.0715	0.0314	0.0401
90	0.0770	0.0338	0.0432
91	0.0839	0.0369	0.0471
92	0.0931	0.0409	0.0522
93	0.0686	0.0301	0.0385
94	0.0859	0.0377	0.0482
95	0.1199	0.0527	0.0673
96	0.2388	0.0755	0.1633
97	0.6884	0.0755	0.6129
98	0.0875	0.0384	0.0491
99	0.0934	0.0410	0.0524
100	0.0771	0.0339	0.0433
101	0.0671	0.0295	0.0376
102	0.0600	0.0264	0.0337
103	0.0547	0.0240	0.0307
104	0.0506	0.0222	0.0284
105	0.0473	0.0208	0.0265
106	0.0445	0.0196	0.0250
107	0.0422	0.0185	0.0237
108	0.0402	0.0176	0.0225
109	0.0439	0.0193	0.0246
110	0.0423	0.0186	0.0237
111	0.0409	0.0180	0.0230
112	0.0397	0.0174	0.0223
113	0.0385	0.0169	0.0216
114	0.0375	0.0165	0.0210
115	0.0365	0.0160	0.0205
116	0.0356	0.0156	0.0200
117	0.0348	0.0153	0.0195
118	0.0340	0.0149	0.0191
119	0.0333	0.0146	0.0187
120	0.0326	0.0143	0.0183
121	0.0320	0.0141	0.0180
122	0.0314	0.0138	0.0176
123	0.0309	0.0136	0.0173
124	0.0303	0.0133	0.0170
125	0.0298	0.0131	0.0167
126	0.0293	0.0129	0.0165
127	0.0289	0.0127	0.0162
128	0.0285	0.0125	0.0160
129	0.0281	0.0123	0.0157
130	0.0277	0.0121	0.0155
131	0.0273	0.0120	0.0153
132	0.0269	0.0118	0.0151

133	0.0266	0.0117	0.0149
134	0.0262	0.0115	0.0147
135	0.0259	0.0114	0.0145
136	0.0256	0.0112	0.0144
137	0.0253	0.0111	0.0142
138	0.0250	0.0110	0.0140
139	0.0247	0.0109	0.0139
140	0.0245	0.0108	0.0137
141	0.0242	0.0106	0.0136
142	0.0240	0.0105	0.0134
143	0.0237	0.0104	0.0133
144	0.0235	0.0103	0.0132

Total soil rain loss = 2.50(In)
Total effective rainfall = 3.78(In)
Peak flow rate in flood hydrograph = 26.91(CFS)

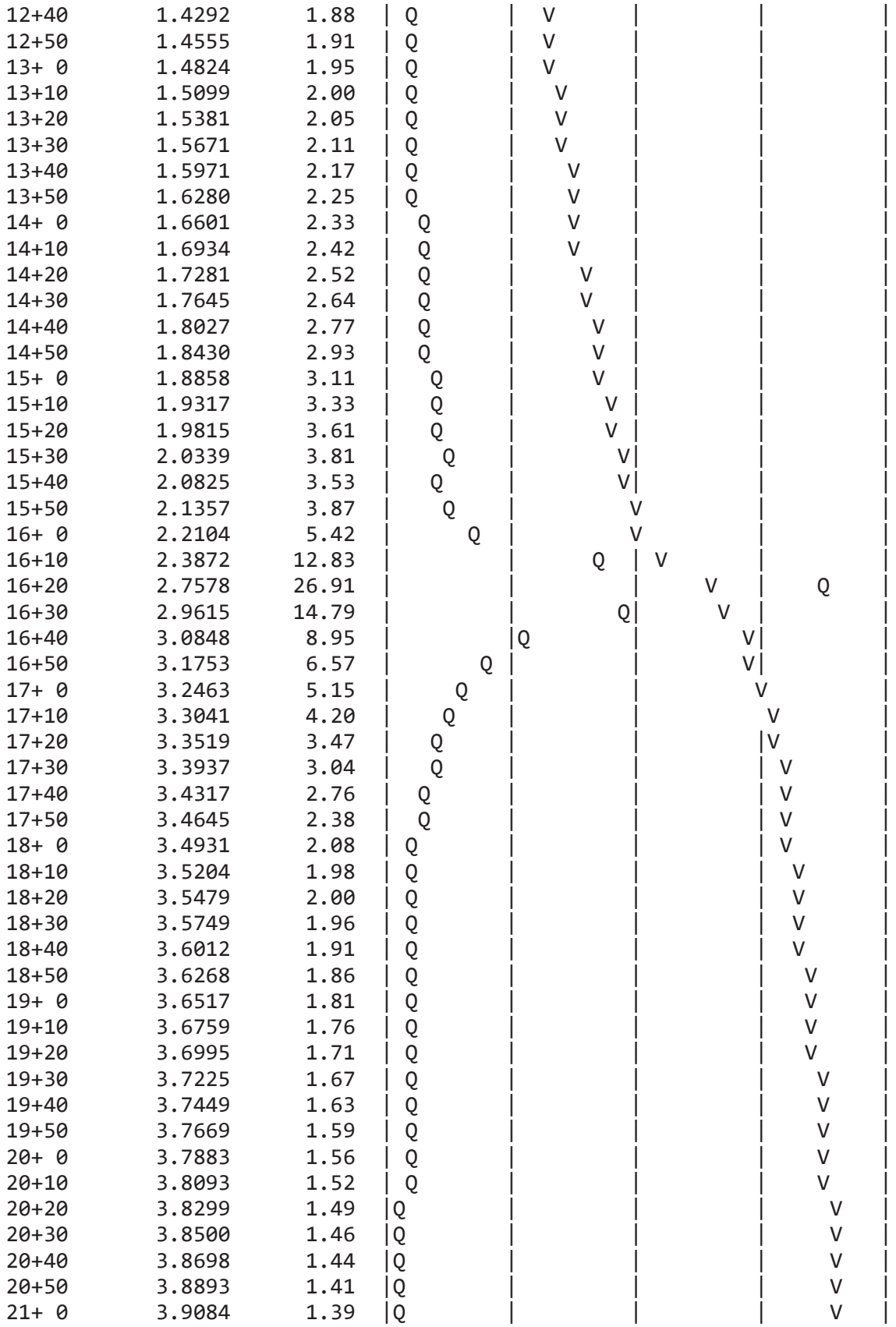
++

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 10 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+10	0.0014	0.10	Q				
0+20	0.0095	0.59	Q				
0+30	0.0207	0.82	VQ				
0+40	0.0335	0.92	VQ				
0+50	0.0470	0.99	VQ				
1+ 0	0.0612	1.03	VQ				
1+10	0.0757	1.06	VQ				
1+20	0.0905	1.07	VQ				
1+30	0.1055	1.09	VQ				
1+40	0.1207	1.10	|Q				
1+50	0.1360	1.11	|Q				
2+ 0	0.1514	1.12	|Q				
2+10	0.1669	1.12	|Q				
2+20	0.1825	1.13	|Q				
2+30	0.1982	1.14	|Q				
2+40	0.2139	1.14	|QV				
2+50	0.2298	1.15	|QV				
3+ 0	0.2457	1.16	|QV				
3+10	0.2617	1.16	|QV				
3+20	0.2778	1.17	|QV				
3+30	0.2941	1.18	|QV				
3+40	0.3104	1.18	|QV				
3+50	0.3268	1.19	|Q V				
4+ 0	0.3433	1.20	|Q V				

4+10	0.3599	1.21	Q V			
4+20	0.3766	1.21	Q V			
4+30	0.3935	1.22	Q V			
4+40	0.4104	1.23	Q V			
4+50	0.4275	1.24	Q V			
5+ 0	0.4447	1.25	Q V			
5+10	0.4620	1.26	Q V			
5+20	0.4794	1.26	Q V			
5+30	0.4969	1.27	Q V			
5+40	0.5146	1.28	Q V			
5+50	0.5323	1.29	Q V			
6+ 0	0.5503	1.30	Q V			
6+10	0.5683	1.31	Q V			
6+20	0.5865	1.32	Q V			
6+30	0.6048	1.33	Q V			
6+40	0.6233	1.34	Q V			
6+50	0.6420	1.35	Q V			
7+ 0	0.6607	1.36	Q V			
7+10	0.6797	1.37	Q V			
7+20	0.6988	1.39	Q V			
7+30	0.7180	1.40	Q V			
7+40	0.7375	1.41	Q V			
7+50	0.7571	1.42	Q V			
8+ 0	0.7769	1.44	Q V			
8+10	0.7968	1.45	Q V			
8+20	0.8170	1.46	Q V			
8+30	0.8373	1.48	Q V			
8+40	0.8579	1.49	Q V			
8+50	0.8787	1.51	Q V			
9+ 0	0.8996	1.52	Q V			
9+10	0.9208	1.54	Q V			
9+20	0.9423	1.56	Q V			
9+30	0.9640	1.57	Q V			
9+40	0.9859	1.59	Q V			
9+50	1.0081	1.61	Q V			
10+ 0	1.0305	1.63	Q V			
10+10	1.0532	1.65	Q V			
10+20	1.0762	1.67	Q V			
10+30	1.0995	1.69	Q V			
10+40	1.1231	1.71	Q V			
10+50	1.1471	1.74	Q V			
11+ 0	1.1714	1.76	Q V			
11+10	1.1960	1.79	Q V			
11+20	1.2210	1.82	Q V			
11+30	1.2464	1.84	Q V			
11+40	1.2722	1.87	Q V			
11+50	1.2984	1.91	Q V			
12+ 0	1.3251	1.94	Q V			
12+10	1.3520	1.95	Q V			
12+20	1.3778	1.87	Q V			
12+30	1.4034	1.86	Q V			



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   21+10       3.9271      1.36  |Q        |         |         |      V  |
   21+20       3.9456      1.34  |Q        |         |         |      V  |
   21+30       3.9638      1.32  |Q        |         |         |      V  |
   21+40       3.9817      1.30  |Q        |         |         |      V  |
   21+50       3.9994      1.28  |Q        |         |         |      V  |
   22+ 0       4.0168      1.26  |Q        |         |         |      V  |
   22+10       4.0339      1.25  |Q        |         |         |       V |
   22+20       4.0509      1.23  |Q        |         |         |       V |
   22+30       4.0676      1.21  |Q        |         |         |       V |
   22+40       4.0841      1.20  |Q        |         |         |       V |
   22+50       4.1004      1.18  |Q        |         |         |       V |
   23+ 0       4.1165      1.17  |Q        |         |         |       V |
   23+10       4.1325      1.16  |Q        |         |         |       V |
   23+20       4.1482      1.14  |Q        |         |         |        V|
   23+30       4.1638      1.13  |Q        |         |         |        V|
   23+40       4.1792      1.12  |Q        |         |         |        V|
   23+50       4.1944      1.11  |Q        |         |         |        V|
   24+ 0       4.2095      1.10  |Q        |         |         |        V|
   24+10       4.2231      0.98  |Q        |         |         |        V|
   24+20       4.2298      0.49  Q         |         |         |        V|
   24+30       4.2334      0.26  Q         |         |         |        V|
-------------------------------------------------------------------------
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CITY OF HESPERIA

POST_DEVELOPMENT EXHIBIT FOR HCC2 INDUSTRIAL PARK



VICINITY MAP
NOT TO SCALE

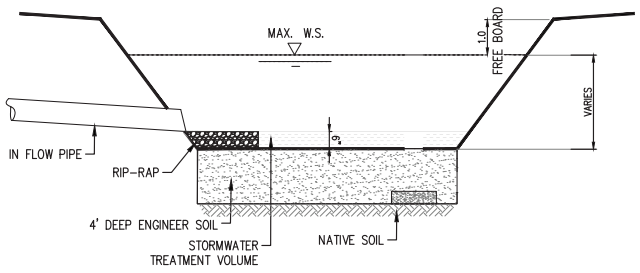
HYDROLOGY SUMMARY					
DRAINAGE AREA No.	TRIBUTARY AREA (AC)	IMPERVIOUS RATIO	DESIGN CAPTURE VOLUME (CFT)	REQUIRED 90% VOLUME (Δ POST-PRE (CFT)	TOTAL PROVIDED VOLUME (CFT)
DA1–DMA A	52.95	0.84	291,852		2,223,558
DA1–DMA B	72.59	1.00	487,872	2,347,410	
DA1–DMA C	55.71	0.84	309,712		

LEGEND:

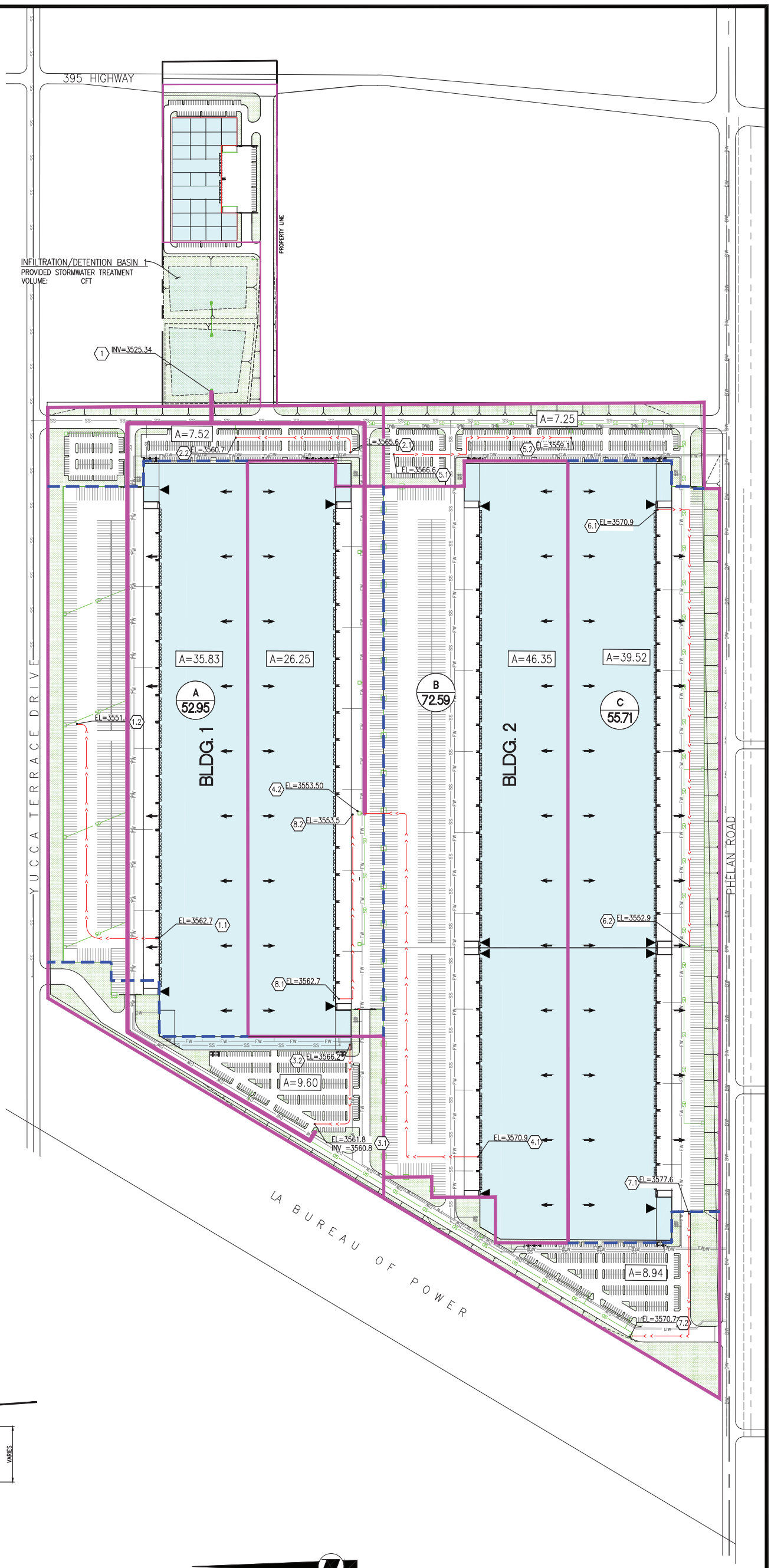
- SUB DRAINAGE AREA BOUNDARY
- DRAINAGE AREA BOUNDARY
- STORM DRAIN
- FLOW PATH
- PROPOSED FLOW DIRECTION ARROW
- X / XXX — DRAINAGE AREA DESIGNATION / AREA (AC)
- 1.0 — REACH NUMBER
- A=3.0 — SUB–DRAINAGE AREA (AC)
- BMP SYSTEMS (UNDERGROUND CMP, DETENTION/RETENTION BASIN
- BUILDINGS
- LANDSCAPE

HYDROLOGY INFORMATION

SITE AREA 1: 185 ACRE
SOIL GROUP: A (PER SBC SOIL GROUP MAP FIGURE C–15)
ISOHYETALS: 1.29" (100–YEAR 1 HOUR)
0.448" (2–YEAR 1 HOUR)
CN NUMBER: 32 (SOIL GROUP A)
FREQUENCY: 100 YEAR (FOR STORM DRAIN DESIGN)
2 YEAR (FOR STORMWATER QUALITY)
METHOD: SAN BERNARDINO COUNTY HYDROLOGY MANUAL



INFILTRATION/DETENTION DETAIL
N.T.S



200 0 200 400
scale 1"= 200' feet

PREPARED BY:	HCCII INDUSTRIAL PARK WQMP EXHIBIT	DATE: OCT 2019
WestLAND Group, Inc. Land Surveyors • Civil Engineers • GIS 4150 CONCOURS, ONTARIO, CA 91764 PHONE: (909) 989–9789 FAX: (909) 989–9660 JOB NO: 2017–289	CITY OF HESPERIA	SHEET 1 OF 1

CITY OF HESPERIA
PRE_DEVELOPMENT EXHIBIT
FOR
HCC2 INDUSTRIAL PARK

LEGEND:

- DRAINAGE AREA BOUNDARY
- SUB DRAINAGE AREA BOUNDARY
- FLOW PATH
- PROPOSED FLOW DIRECTION ARROW
- A=3.0 — SUB-DRAINAGE AREA (AC)
- X / XXX — DRAINAGE AREA DESIGNATION / AREA (AC)
- 1.0 — REACH NUMBER
- HP — HIGHT POINT

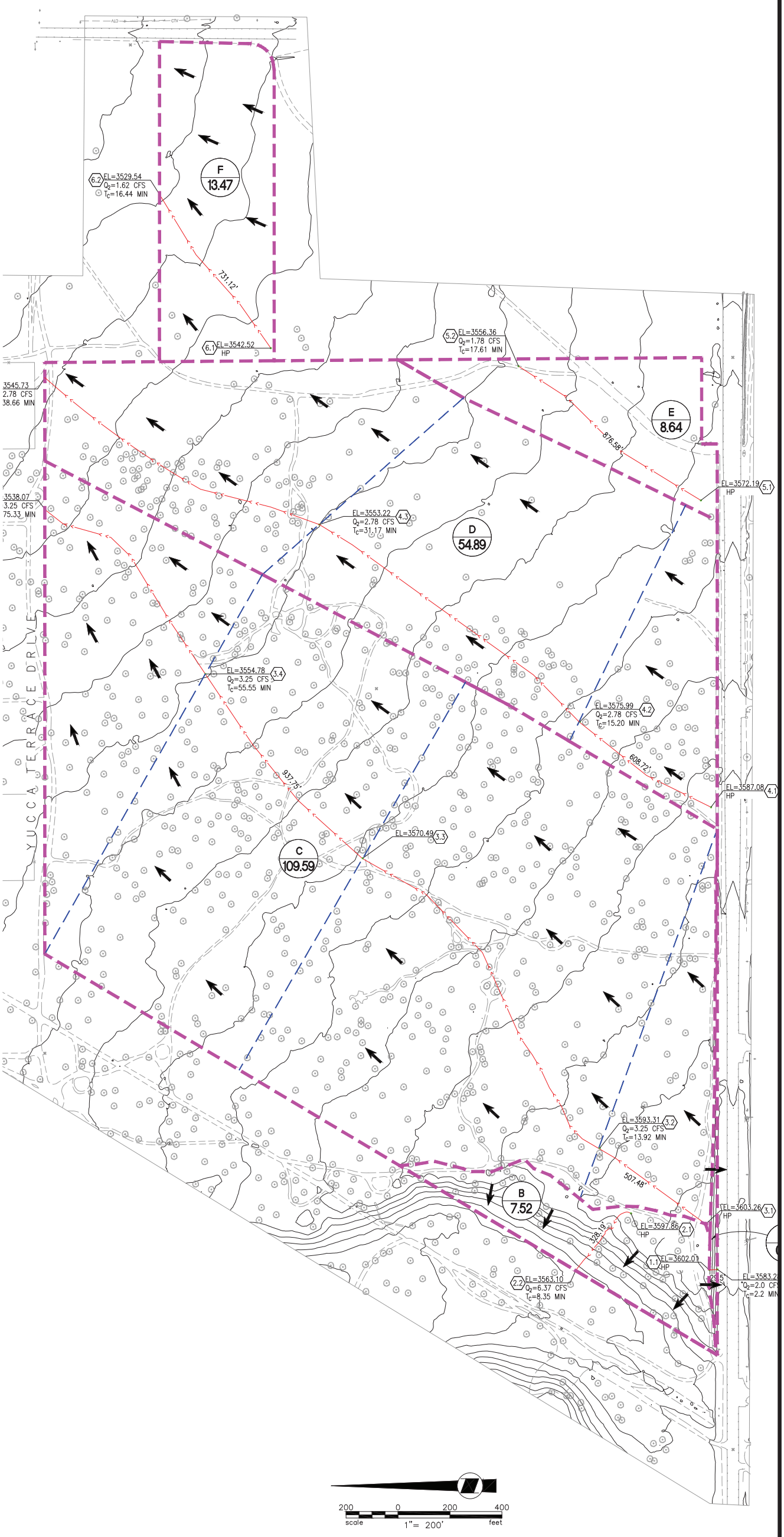
HYDROLOGY INFORMATION

SITE AREA 1: 193.63 ACRE
SOIL GROUP: A (PER SBC SOIL GROUP MAP FIGURE C-15)
ISOHYETALS: 1.29" (100-YEAR 1 HOUR)
0.77" (10-YEAR 1 HOUR)
CN NUMBER: 67 (SOIL GROUP A)

FREQUENCY: 100 YEAR (FOR STORM DRAIN DESIGN)
2 YEAR (FOR STORMWATER QUALITY)
METHOD: SAN BERNARDINO COUNTY HYDROLOGY MANUAL

HYDROLOGY SUMMARY

DRAINAGE AREA No.	TRIBUTARY AREA (AC)	PERVIOUS RATIO	VOLUME (CFT)
AREA A	0.61	1.00	8,346
AREA B	7.52	1.00	102,728
AREA C	109.58	1.00	1,477,133
AREA D	54.90	1.00	743,887
AREA E	8.64	1.00	117,559
AREA F	6.72	1.00	183,366
TOTAL	193.63		2,633,019



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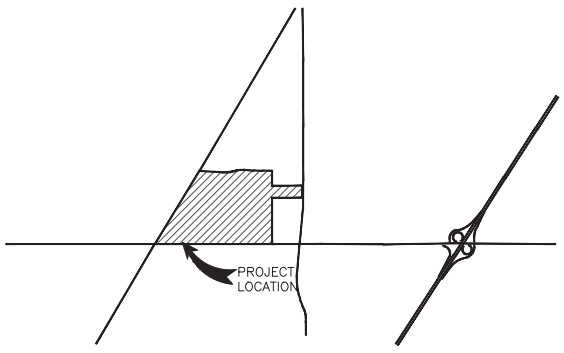
JOB NO: 2017-289

HCCII INDUSTRIAL PARK
WQMP EXHIBIT

CITY OF HESPERIA

DATE: OCT 2019
SHEET 1 OF 2



VICINITY MAP
NOT TO SCALE

CITY OF HESPERIA
POST_DEVELOPMENT EXHIBIT FOR HCC2 INDUSTRIAL PARK

395 HIGHWAY

INFILTRATION/DETENTION BASIN 1
PROVIDED STORMWATER TREATMENT
VOLUME: 1,438,250 CFT

YUCCA TERRACE DRIVE

PHELAN ROAD

LA BUREAU OF POWER

BLDG. 1

BLDG. 2

LEGEND:

- SUB DRAINAGE AREA BOUNDARY
- DRAINAGE AREA BOUNDARY
- STORM DRAIN
- FLOW PATH
- PROPOSED FLOW DIRECTION ARROW
- X / XXX — DRAINAGE AREA DESIGNATION / AREA (AC)
- 1.0 — REACH NUMBER
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- BMP SYSTEMS (UNDERGROUND CMP, DETENTION/RETENTION BASIN
- BUILDINGS
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HYDROLOGY INFORMATION

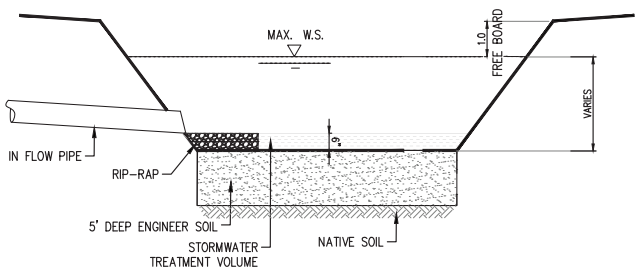
SITE AREA 1: 185 ACRE
SOIL GROUP: A (PER SBC SOIL GROUP MAP FIGURE C-15)
ISOHYETALS: 1.29" (100-YEAR 1 HOUR)
0.448" (2-YEAR 1 HOUR)
CN NUMBER: 32 (SOIL GROUP A)

FREQUENCY: 100 YEAR (FOR STORM DRAIN DESIGN)
2 YEAR (FOR STORMWATER QUALITY)

METHOD: SAN BERNARDINO COUNTY HYDROLOGY MANUAL

HYDROLOGY SUMMARY

DRAINAGE AREA No.	TRIBUTARY AREA (AC)	IMPERVIOUS RATIO	REQUIRED 90% VOLUME (Δ POST-PRE (CFT)	TOTAL PROVIDED VOLUME (CFT)
DA1-DMA A	53.16	0.15	907,083	1,438,250
DA1-DMA B	71.42	0.04		
DA1-DMA C	48.20	0.16		
DA1-DMA D	12.45	0.51		



INFILTRATION/DETENTION DETAIL
N.T.S

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scale 1"= 200' feet

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JOB NO: 2017-289

HCCII INDUSTRIAL PARK
WQMP EXHIBIT

CITY OF HESPERIA

DATE: OCT 2019
SHEET 1 OF 1