APPENDIX 8a

Preliminary Hydrology Study

PRELIMINARY HYDROLOGY AND CHANNEL DESIGN FOR CITY CREEK BY-PASS CHANNEL

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CALIFORNIA

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APRIL 20, 2020

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

04/20/2020

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I. PURPOSE AND SCOPE

The purpose of this study is to determine the peak flow rates for the City Creek By-Pass Channel. The City Creek By-Pass Channel is located along 3rd Street and 5th Street and extends from Warm Creek Channel at the downstream terminus and terminates at City Creek Channel just north of the State Route 30 and 5th Street Interchange, see Figure 1. The City Creek By-Pass Channel has been identified by San Bernardino County Flood Control District as a regional channel system that is part of the Comprehensive Storm Drain Plan Number 6 (CSDP #6) that was prepared by Exponent Analysis dated August 2001. The purpose of the study is to determine the peak flow rates for the City Creek By-Pass Channel based on an updated land use that has been proposed for the project area.

The scope of the study includes the following:

1. Determination of points of flow concentration and watershed subareas tributary to City Creek By-Pass Channel.
2. Determination of the 100-year peak storm flows based upon the ultimate condition tributary drainage area utilizing the Rational Method and Unit Hydrograph Method as outlined in the San Bernardino County Flood Control Hydrology Manual.
3. Develop a preliminary channel design that will function within the existing right-of-way that can convey the 100-year storm event. The proposed channel design will develop an approach that can be considered environmentally feasible.
4. Preparation of a report which consist of hydrological and analytical results and exhibits.

II. PROJECT SITE AND DRAINAGE AREA OVERVIEW

The City Creek By-Pass Channel is a proposed regional storm drain system that has been identified by CSPD #6. The channel system was proposed as a trapezoidal concrete lined channel that had a base width of 40 feet and a depth of 5 feet. CSPD #6 established flow rates that ranged from 878 ft^3/s at Palm Avenue to 1,618 ft^3/s at Warm Creek Channel, see Excerpt A. The proposed channel is located along the existing City Creek By-Pass Channel which is a soft bottom channel with wire-revetment to control lateral erosion. The existing channel does not have the capacity to convey the runoff from the tributary area due to the undersized culverts that existing along the existing channel alignment. The existing runoff from the area drains in the east to west direction. The major streets that are located in the north to south direction behave like interceptor channels. These major streets convey the runoff towards City Creek By-Pass Channel. The overall tributary area is approximately 1,750 acres and has been illustrated in Figure 2 along with the City Creek By-Pass Channel. The City Creek By-Pass Channel project is located in the City of San Bernardino and the City of Highland.

The IVDA has contracted a study to assess land use and planning uses for the overall area that is tributary to City Creek By-Pass Channel. As part of the study, JLC performed hydrology analyses that evaluated the 1,750 acre watershed using the updated land uses and

planning areas envisioned for the area. The hydrology analyses focused on developing flow rates at four nodal points at the following locations:

1. Victoria Avenue and City Creek By-Pass Channel
2. Sterling Avenue and City Creek By-Pass Channel
3. Tippecanoe Avenue and City Creek By-Pass Channel
4. Warm Creek Channel and City Creek By-Pass Channel

These nodal points were used to perform comparison analyses with the flow rate values used in CSDP #6.

III. HYDROLOGY

The San Bernardino County Hydrology Manual (Reference 1), was used to develop the hydrological parameters for the hydrology analyses. The rational method and unit hydrograph method were used for the analyses and the computations were performed using the computer program developed by Civil Cadd/Civil Design.

The rainfall depths used in the hydrology calculations for the rational method and the unit hydrograph method are as follows:

Storm Event & Duration	Rainfall (inches)
100-Year, 1-Hour	1.35
100-Year, 6-Hour	2.84
100-Year, 24-Hour	5.42

The rainfall depths were obtained from NOAA Atlas 14, which has been included as Excerpt B.

The existing soil classification for the tributary watershed area consists of Hydrologic Soil Group "A" and a small minor area is defined as "D". Excerpt C includes the soil data from the National Resource Conservation Service Websoil Survey. An Antecedent Moisture Condition of II was used for the 100-year calculations.

Exhibit B was created to identify the land use for the watershed area. The land uses identified were based on the General Plan land use data obtained from the City of San Bernardino, the City of Highland and the IVDA Specific Plan land use and planning area. The developed areas were defined as areas that will have commercial/residential landscape covers and the open space areas were defined as open brush poor cover. The following Curve Numbers and pervious areas were used based on the land use types identified in Exhibit B:

Curve Numbers Pervious Ratios based on Land Use Type

Land Use Cover	Curve Number Number (Soil "A")	Curve Number Number (Soil "B")	Pervious Ratio
Commercial/Industrial	32		0.10
Low Density Residential	32		0.70
Medium Density	32		0.50
High Density Residential	32		0.20
Public/Institution	32		0.40
Office/Business Park	32		0.10
Open Space	32		1

In order to perform the hydrology analyses the San Bernardino County Hydrology Manual requires that watersheds over 640 acres use the Unit Hydrograph method to determine the peak flow rate for the tributary area. Moreover, the Unit Hydrograph model requires the time of concentration for the watershed area in order to compute the lag time. As a result, hydrology models using the rational method were developed for the City Creek By-Pass Channel. Exhibit A has been developed in order to identify the areas and the nodal points used in the hydrology model. The rational method calculations have been included in Appendix A and the unit hydrograph calculations have been included in Appendix B. The hydrology map, Exhibit A, provides the parameters used in the hydrology model. The following nodal points that were analyzed are listed below with the corresponding location:

1. Node 108 - Victoria Avenue and City Creek By-Pass Channel
2. Node 109 - Sterling Avenue and City Creek By-Pass Channel
3. Node 110 - Tippecanoe Avenue and City Creek By-Pass Channel
4. Node 111 - Warm Creek Channel and City Creek By-Pass Channel

The following table has been prepared to provide the peak flow rate and time of concentration based on the rational method hydrology:

Location	100 Year Flow Rate (ft^3/s)	Time of Concentration (min)
Node 108	1,277	35.34
Node 109	1,277	46.08
Node 110	1,478	54.95
Node 111	1,477	63.61

These flow rates should not be applied to the design since the results are from the rational method hydrology analyses.

The following table has been prepared to provide a comparative analysis between the flow rates developed as part of the hydrology and the flow rates identified in the CSDP#6 Hydrology Map:

Location	100 Year Flow Rate (ft^3/s)	CSDP #6 100 Year Flow Rate (ft^3/s)
Node 108	1,363	1,338
Node 109	1,363(1)	1,351
Node 110	1637	1,591
Node 111	1637(2)	1,618

Notes:
(1) The hydrology model flow rate at Node 109 is 1271 ft^3/s. Use upstream flow rate since the value is greater than the downstream flow rate.
(2) The hydrology model flow rate at Node 111 is 1615 ft^3/s. Use upstream flow rate since the value is greater than the downstream flow rate.

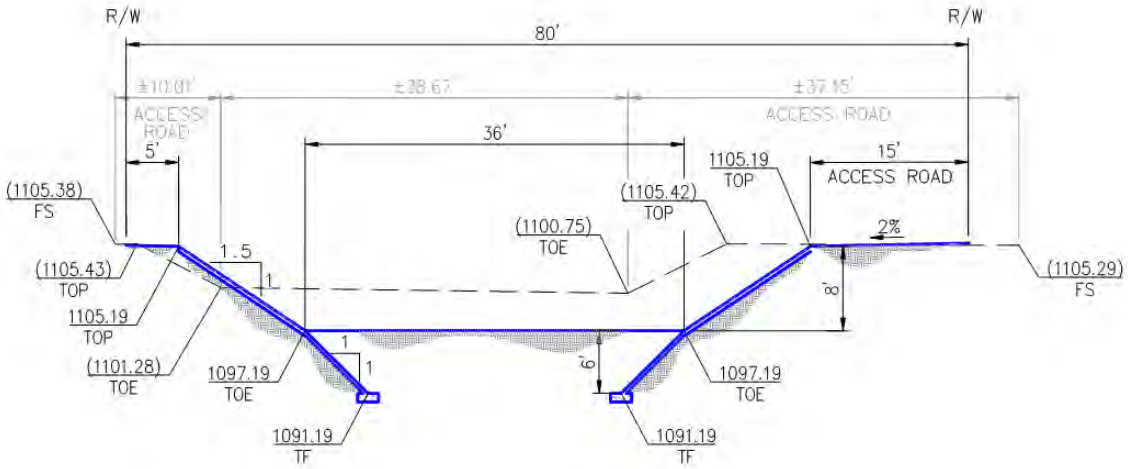
Based on the hydrology analyses performed for the watershed area tributary to City Creek By-Pass Channel, the flow rates developed for the study are within 2% to 3% of the flow rates developed for the CSDP #6 Study performed by Exponent Analysis. It can be concluded that the CSDP #6 used land use assumption that are similar to the land use assumption that were part of the City of San Bernardino General Plan, City of Highland General Plan and the IVDA Proposed Land Use Plan.

IV. CHANNEL DESIGN

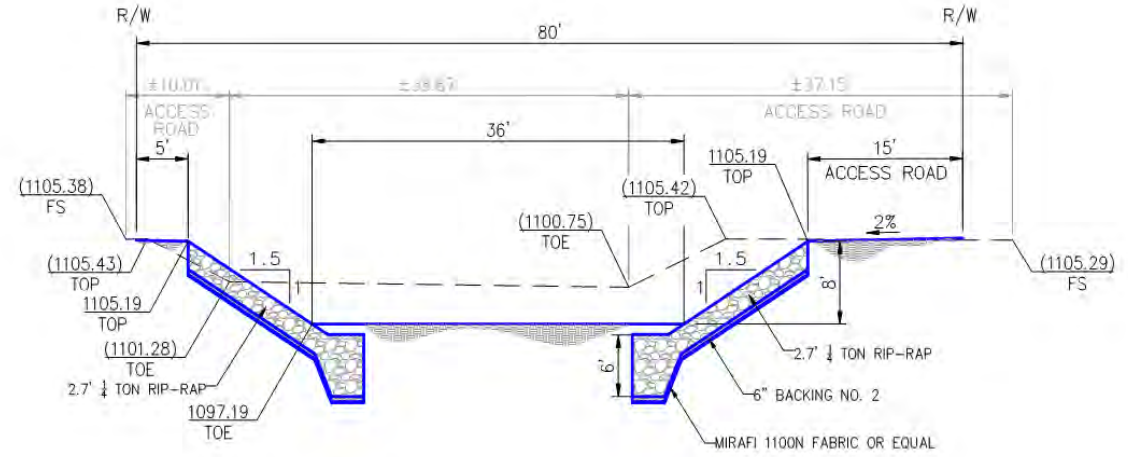
In conjunction with hydrology analyses, plan and profiles were created for the City Creek By-Pass Channel that extend from Warm Creek Channel to Victoria Avenue. The profiles were prepared at a scale of 1"=100' horizontally and 1"=10' vertically. The purpose of the preliminary channel design is to determine the lines and grades that can be used for the City Creek By-Pass Channel. The proposed alternatives have used the following types of channel cross sections:

1. A concrete lined side slopes with 1.5:1 side slopes and an earthen bottom with a base width that varies. The base width of the channel is controlled by the available right-of-way that exists. The base width ranges from 23 feet to 36 feet. The concrete lining will extend 6 feet below the channel to protect against channel degradation. See Section A-A.

2. A rip-rap lined side slope channel with 1.5:1 side slopes and an earthen lined base width that varies. The base width ranges from 23 feet to 36 feet. The channel will use a block of rip-rap protection that will collapse in case the channel bed begins to degrade. The block of rip-rap will extend 6 feet below the channel invert. See Section B-B.



Section A-A: Concreted Lined Side Slopes and Earthen Bottom



Section B-B: Rip-Rap Lined Side Slopes and Earthen Bottom

The design of these alternatives is required in order to provide a potential channel design that can be permitted with the resource agencies. The concrete lined channel identified in the CSDP #6 is not considered a viable alternative since the existing City Creek By-Pass Channel is considered a blue line stream and is subject to the regulations of the Clean Water Act and Porter -Cologne Water Quality Act.

A preliminary assessment for the design alternatives were performed in order to determine the depth of flow based on uniform-steady flow condition. In order to perform the analyses the FlowMaster Program was used to compute the normal depth of the channel using the corresponding flow rate for the reach. It should be noted that further detailed analyses will be required during final engineering to account for the proposed culvert crossings.

The following are the depths of flow for the proposed channel design alternatives:

Concrete Side Slope Channel / Earthen Bottom

Location	100 Year Flow Rate (ft^3/s)	Depth of Flow (ft)
Reach 1 – Warm Creek Channel to Tippecanoe	1,363	3.73
Reach 2 – Tippecanoe to Sterling	1,637	5.05
Reach 3 – Sterling to Victoria	1637	4.61

Rip-Rap Side Slope Channel / Earthen Bottom

Location	100 Year Flow Rate (ft^3/s)	Depth of Flow (ft)
Reach 1 – Warm Creek Channel to Tippecanoe	1,363	3.40
Reach 2 – Tippecanoe to Sterling	1,637	6.07
Reach 3 – Sterling to Victoria	1637	5.38

San Bernardino County Flood Control District typically uses the Los Angeles County Flood Control District Hydraulic Manual to establish design guidelines. The Los Angeles County Hydraulic Manual requires 2.5 feet of freeboard in the design of trapezoidal channels with velocities less than 35 ft/s. The preliminary hydraulic results indicate that the project has sufficient freeboard for the 100 year flow rate based on the depth of channels that range from 8 feet deep to 9 feet deep.

VI. FINDINGS

The hydrology analyses and preliminary channel design evaluated the City Creek By-Pass Channel system. The hydrology analyses indicated that the flow rates are comparable with the flow rates established by the CSDP #6 which is the master drainage plan for the regional facilities required for the area. Based on the hydrology analyses and the proposed channel design alternatives, the proposed City Creek Channel By-Pass has sufficient capacity to convey the 100 year flow rates and mitigate impacts associated with flooding within the watershed area.

VII. REFERENCES

1. San Bernardino Flood Control Hydrology Manual, August 1986.
2. Los Angeles County Flood Control Hydraulic Manual, March 1982
3. Comprehensive Storm Drain Plan (CSDP) No. 6, Exponent, August 2001

FIGURES

FIGURE 1: VICINITY MAP

IVDA 3RD AND 6TH STREET SPECIFIC PLAN VICINITY MAP

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FIGURE 1

Drawing Name: O:\254.01.17\Engineering\Hydrology_Plan\Exhibits\Figures\Figure 1 - Vicinity Map.dwg
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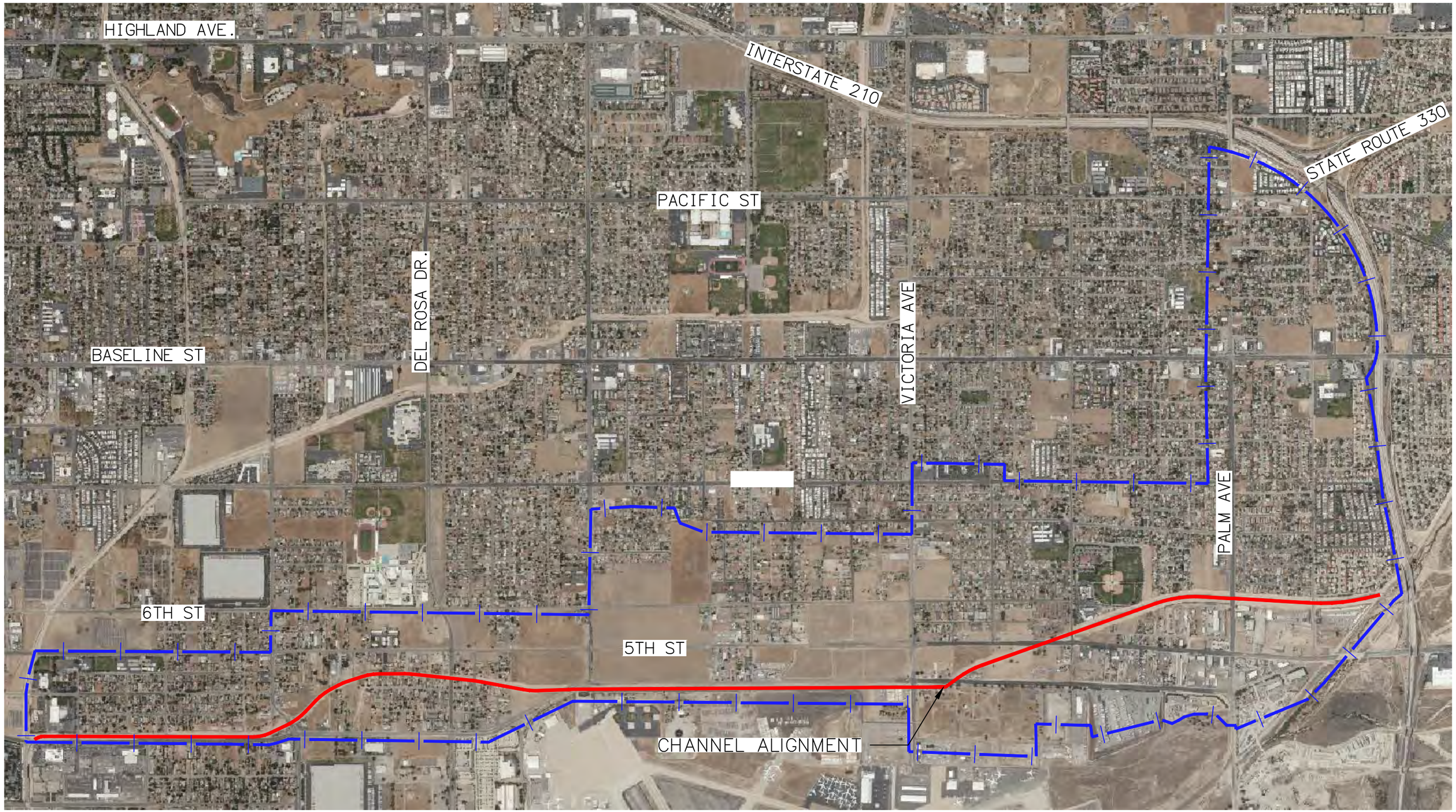
FIGURE 2: CHANNEL ALIGNMENT AND WATERSHED MAP



IVDA 3RD AND 6TH STREET SPECIFIC PLAN
CHANNEL ALIGNMENT AND WATERSHED

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FIGURE 2

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APPENDICES

APPENDIX A: ULTIMATE CONDITION RATIONAL METHOD HYDROLOGY – 100 YEAR

APPENDIX A.1: RATIONAL METHOD ANALYSIS, NODE 108

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: 04/16/20

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR RATIONAL TABLING METHOD
FN: ARA108.RSB

Program License Serial Number 6269

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

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Process from Point/Station 101.000 to Point/Station 102.000
**** 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) = 0.4200 Max loss rate(Fm)= 0.411(In/Hr)
Initial subarea data:
Initial area flow distance = 534.000(Ft.)
Top (of initial area) elevation = 1334.000(Ft.)
Bottom (of initial area) elevation = 1318.000(Ft.)
Difference in elevation = 16.000(Ft.)
Slope = 0.02996 s(%)= 3.00
TC = k(0.378)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.403 min.
Rainfall intensity = 4.104(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff = 16.955(CFS)
Total initial stream area = 5.100(Ac.)
Pervious area fraction = 0.420
Initial area Fm value = 0.411(In/Hr)

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Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1318.000(Ft.)
End of street segment elevation = 1291.000(Ft.)
Length of street segment = 898.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.025
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150

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 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     73.754(CFS)
Depth of flow =   0.599(Ft.), Average velocity =   6.291(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.94(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   6.29(Ft/s)
Travel time =    2.38 min.     TC =   11.78  min.
 Adding area flow to street
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) = 0.2200     Max loss rate(Fm)=     0.215(In/Hr)
Rainfall intensity =      3.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =    113.470(CFS) for   38.200(Ac.)
Total runoff =    130.425(CFS)
Effective area this stream =       43.30(Ac.)
Total Study Area (Main Stream No. 1) =       43.30(Ac.)
Area averaged Fm value =    0.238(In/Hr)
Street flow at end of street =    130.425(CFS)
Half street flow at end of street =     65.212(CFS)
Depth of flow =   0.701(Ft.), Average velocity =   7.457(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    8.06(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1291.000(Ft.)
End of street segment elevation =  1242.000(Ft.)
Length of street segment  =  1677.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    239.797(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.203(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   13.47(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   9.20(Ft/s)
Travel time =    3.04 min.     TC =   14.82  min.
 Adding area flow to street
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) = 0.5200     Max loss rate(Fm)=     0.508(In/Hr)
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
Subarea runoff =    218.627(CFS) for  100.500(Ac.)
Total runoff =    349.052(CFS)
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Effective area this stream =      143.80(Ac.)
Total Study Area (Main Stream No. 1) =      143.80(Ac.)
Area averaged Fm value =    0.427(In/Hr)
Street flow at end of street =    349.052(CFS)
Half street flow at end of street =    174.526(CFS)
Depth of flow =   0.940(Ft.), Average velocity =  10.695(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   17.59(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1242.000(Ft.)
End of street segment elevation =  1202.000(Ft.)
Length of street segment  =  2393.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    473.053(CFS)
Depth of flow =   1.153(Ft.), Average velocity =  10.214(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   26.13(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =  10.21(Ft/s)
Travel time =    3.90 min.     TC =   18.72  min.
 Adding area flow to street
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) = 0.5400     Max loss rate(Fm)=     0.528(In/Hr)
Rainfall intensity =      2.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.741
Subarea runoff =    247.833(CFS) for  152.800(Ac.)
Total runoff =    596.886(CFS)
Effective area this stream =      296.60(Ac.)
Total Study Area (Main Stream No. 1) =      296.60(Ac.)
Area averaged Fm value =    0.479(In/Hr)
Street flow at end of street =    596.886(CFS)
Half street flow at end of street =    298.443(CFS)
Depth of flow =   1.262(Ft.), Average velocity =  11.210(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   30.47(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      105.000 to Point/Station      106.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1202.000(Ft.)
End of street segment elevation =  1194.000(Ft.)
Length of street segment  =  2317.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    673.675(CFS)
Depth of flow =   1.866(Ft.), Average velocity =   7.331(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   54.62(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   7.33(Ft/s)
Travel time =    5.27 min.     TC =   23.99  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 35.36
Pervious ratio(Ap) = 0.6100     Max loss rate(Fm)=     0.583(In/Hr)
Rainfall intensity =      2.340(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.702
Subarea runoff =    153.460(CFS) for  160.400(Ac.)
Total runoff =    750.345(CFS)
Effective area this stream =      457.00(Ac.)
Total Study Area (Main Stream No. 1) =      457.00(Ac.)
Area averaged Fm value =    0.516(In/Hr)
Street flow at end of street =    750.345(CFS)
Half street flow at end of street =    375.173(CFS)
Depth of flow =   1.962(Ft.), Average velocity =   7.654(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   58.46(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1194.000(Ft.)
Downstream point elevation =  1166.000(Ft.)
Channel length thru subarea  =  2722.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =    773.416(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =    773.416(CFS)
Depth of flow =   2.943(Ft.), Average velocity =   8.271(Ft/s)
Channel flow top width =   43.546(Ft.)
Flow Velocity =    8.27(Ft/s)
Travel time  =    5.49 min.
Time of concentration =   29.48 min.
Critical depth =      2.938(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 33.50
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.581(In/Hr)
Rainfall intensity =      2.068(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.670
```

```
Subarea runoff =     46.052(CFS) for  118.000(Ac.)
Total runoff =    796.397(CFS)
Effective area this stream =      575.00(Ac.)
Total Study Area (Main Stream No. 1) =      575.00(Ac.)
Area averaged Fm value =    0.529(In/Hr)
Depth of flow =   2.988(Ft.), Average velocity =   8.340(Ft/s)
Critical depth =      2.969(Ft.)


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Process from Point/Station      107.000 to Point/Station      108.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1166.000(Ft.)
Downstream point elevation =  1142.000(Ft.)
Channel length thru subarea  =  2918.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1036.487(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1036.487(CFS)
Depth of flow =   3.625(Ft.), Average velocity =   8.289(Ft/s)
Channel flow top width =   48.997(Ft.)
Flow Velocity =    8.29(Ft/s)
Travel time  =    5.87 min.
Time of concentration =   35.34 min.
Critical depth =      3.438(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.38
Pervious ratio(Ap) = 0.4100     Max loss rate(Fm)=     0.400(In/Hr)
Rainfall intensity =      1.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.671
Subarea runoff =    480.092(CFS) for  451.100(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1026.10(Ac.)
Total Study Area (Main Stream No. 1) =     1026.10(Ac.)
Area averaged Fm value =    0.472(In/Hr)
Depth of flow =   4.022(Ft.), Average velocity =   8.795(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)
End of computations, Total Study Area =         1026.10 (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) = 0.486
Area averaged SCS curve number =  32.9
```

APPENDIX A.2: RATIONAL METHOD ANALYSIS, NODE 109

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: 04/16/20

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR RATIONAL TABLING METHOD
FN: ARA109.RSB

Program License Serial Number 6269

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 101.000 to Point/Station 102.000
**** 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) = 0.4200 Max loss rate(Fm)= 0.411(In/Hr)
Initial subarea data:
Initial area flow distance = 534.000(Ft.)
Top (of initial area) elevation = 1334.000(Ft.)
Bottom (of initial area) elevation = 1318.000(Ft.)
Difference in elevation = 16.000(Ft.)
Slope = 0.02996 s(%)= 3.00
TC = k(0.378)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.403 min.
Rainfall intensity = 4.104(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff = 16.955(CFS)
Total initial stream area = 5.100(Ac.)
Pervious area fraction = 0.420
Initial area Fm value = 0.411(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1318.000(Ft.)
End of street segment elevation = 1291.000(Ft.)
Length of street segment = 898.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.025
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150

```
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     73.754(CFS)
Depth of flow =   0.599(Ft.), Average velocity =   6.291(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.94(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   6.29(Ft/s)
Travel time =    2.38 min.     TC =   11.78  min.
 Adding area flow to street
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) = 0.2200     Max loss rate(Fm)=     0.215(In/Hr)
Rainfall intensity =      3.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =    113.470(CFS) for   38.200(Ac.)
Total runoff =    130.425(CFS)
Effective area this stream =       43.30(Ac.)
Total Study Area (Main Stream No. 1) =       43.30(Ac.)
Area averaged Fm value =    0.238(In/Hr)
Street flow at end of street =    130.425(CFS)
Half street flow at end of street =     65.212(CFS)
Depth of flow =   0.701(Ft.), Average velocity =   7.457(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    8.06(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1291.000(Ft.)
End of street segment elevation =  1242.000(Ft.)
Length of street segment  =  1677.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    239.797(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.203(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   13.47(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   9.20(Ft/s)
Travel time =    3.04 min.     TC =   14.82  min.
 Adding area flow to street
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) = 0.5200     Max loss rate(Fm)=     0.508(In/Hr)
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
Subarea runoff =    218.627(CFS) for  100.500(Ac.)
Total runoff =    349.052(CFS)
```

```
Effective area this stream =      143.80(Ac.)
Total Study Area (Main Stream No. 1) =      143.80(Ac.)
Area averaged Fm value =    0.427(In/Hr)
Street flow at end of street =    349.052(CFS)
Half street flow at end of street =    174.526(CFS)
Depth of flow =   0.940(Ft.), Average velocity =  10.695(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   17.59(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1242.000(Ft.)
End of street segment elevation =  1202.000(Ft.)
Length of street segment  =  2393.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    473.053(CFS)
Depth of flow =   1.153(Ft.), Average velocity =  10.214(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   26.13(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =  10.21(Ft/s)
Travel time =    3.90 min.     TC =   18.72  min.
 Adding area flow to street
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) = 0.5400     Max loss rate(Fm)=     0.528(In/Hr)
Rainfall intensity =      2.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.741
Subarea runoff =    247.833(CFS) for  152.800(Ac.)
Total runoff =    596.886(CFS)
Effective area this stream =      296.60(Ac.)
Total Study Area (Main Stream No. 1) =      296.60(Ac.)
Area averaged Fm value =    0.479(In/Hr)
Street flow at end of street =    596.886(CFS)
Half street flow at end of street =    298.443(CFS)
Depth of flow =   1.262(Ft.), Average velocity =  11.210(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   30.47(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1202.000(Ft.)
End of street segment elevation =  1194.000(Ft.)
Length of street segment  =  2317.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
```

```
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    673.675(CFS)
Depth of flow =   1.866(Ft.), Average velocity =   7.331(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   54.62(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   7.33(Ft/s)
Travel time =    5.27 min.     TC =   23.99  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 35.36
Pervious ratio(Ap) = 0.6100     Max loss rate(Fm)=     0.583(In/Hr)
Rainfall intensity =      2.340(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.702
Subarea runoff =    153.460(CFS) for  160.400(Ac.)
Total runoff =    750.345(CFS)
Effective area this stream =      457.00(Ac.)
Total Study Area (Main Stream No. 1) =      457.00(Ac.)
Area averaged Fm value =    0.516(In/Hr)
Street flow at end of street =    750.345(CFS)
Half street flow at end of street =    375.173(CFS)
Depth of flow =   1.962(Ft.), Average velocity =   7.654(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   58.46(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1194.000(Ft.)
Downstream point elevation =  1166.000(Ft.)
Channel length thru subarea  =  2722.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =    773.416(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =    773.416(CFS)
Depth of flow =   2.943(Ft.), Average velocity =   8.271(Ft/s)
Channel flow top width =   43.546(Ft.)
Flow Velocity =    8.27(Ft/s)
Travel time  =    5.49 min.
Time of concentration =   29.48 min.
Critical depth =      2.938(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 33.50
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.581(In/Hr)
Rainfall intensity =      2.068(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.670
```

```
Subarea runoff =     46.052(CFS) for  118.000(Ac.)
Total runoff =    796.397(CFS)
Effective area this stream =      575.00(Ac.)
Total Study Area (Main Stream No. 1) =      575.00(Ac.)
Area averaged Fm value =    0.529(In/Hr)
Depth of flow =   2.988(Ft.), Average velocity =   8.340(Ft/s)
Critical depth =      2.969(Ft.)


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Process from Point/Station      107.000 to Point/Station      108.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1166.000(Ft.)
Downstream point elevation =  1142.000(Ft.)
Channel length thru subarea  =  2918.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1036.487(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1036.487(CFS)
Depth of flow =   3.625(Ft.), Average velocity =   8.289(Ft/s)
Channel flow top width =   48.997(Ft.)
Flow Velocity =    8.29(Ft/s)
Travel time  =    5.87 min.
Time of concentration =   35.34 min.
Critical depth =      3.438(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.38
Pervious ratio(Ap) = 0.4100     Max loss rate(Fm)=     0.400(In/Hr)
Rainfall intensity =      1.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.671
Subarea runoff =    480.092(CFS) for  451.100(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1026.10(Ac.)
Total Study Area (Main Stream No. 1) =     1026.10(Ac.)
Area averaged Fm value =    0.472(In/Hr)
Depth of flow =   4.022(Ft.), Average velocity =   8.795(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1142.000(Ft.)
Downstream point elevation =  1104.000(Ft.)
Channel length thru subarea  =  5404.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1276.517(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1276.517(CFS)
Depth of flow =   4.156(Ft.), Average velocity =   8.391(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   52.000(Ft.)
Flow Velocity =    8.39(Ft/s)
Travel time  =   10.73 min.
Time of concentration =   46.08 min.
Critical depth =      3.875(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
```

```
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)
The area added to the existing stream causes a
a lower flow rate of Q =   1129.363(CFS)
therefore the upstream flow rate of Q =   1276.489(CFS) is being used
Rainfall intensity =      1.582(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.638
Subarea runoff =      0.000(CFS) for   92.500(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1118.60(Ac.)
Total Study Area (Main Stream No. 1) =     1118.60(Ac.)
Area averaged Fm value =    0.460(In/Hr)
Depth of flow =   4.156(Ft.), Average velocity =   8.391(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)
End of computations, Total Study Area =         1118.60 (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) = 0.473
Area averaged SCS curve number =  32.8
```

APPENDIX A.3: RATIONAL METHOD ANALYSIS, NODE 110

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: 04/16/20

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR RATIONAL TABLING METHOD
FN: ARA110.RSB

Program License Serial Number 6269

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

++

Process from Point/Station 101.000 to Point/Station 102.000
**** 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) = 0.4200 Max loss rate(Fm)= 0.411(In/Hr)
Initial subarea data:
Initial area flow distance = 534.000(Ft.)
Top (of initial area) elevation = 1334.000(Ft.)
Bottom (of initial area) elevation = 1318.000(Ft.)
Difference in elevation = 16.000(Ft.)
Slope = 0.02996 s(%)= 3.00
TC = k(0.378)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.403 min.
Rainfall intensity = 4.104(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff = 16.955(CFS)
Total initial stream area = 5.100(Ac.)
Pervious area fraction = 0.420
Initial area Fm value = 0.411(In/Hr)

++

Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1318.000(Ft.)
End of street segment elevation = 1291.000(Ft.)
Length of street segment = 898.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.025
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150

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 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     73.754(CFS)
Depth of flow =   0.599(Ft.), Average velocity =   6.291(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.94(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   6.29(Ft/s)
Travel time =    2.38 min.     TC =   11.78  min.
 Adding area flow to street
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) = 0.2200     Max loss rate(Fm)=     0.215(In/Hr)
Rainfall intensity =      3.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =    113.470(CFS) for   38.200(Ac.)
Total runoff =    130.425(CFS)
Effective area this stream =       43.30(Ac.)
Total Study Area (Main Stream No. 1) =       43.30(Ac.)
Area averaged Fm value =    0.238(In/Hr)
Street flow at end of street =    130.425(CFS)
Half street flow at end of street =     65.212(CFS)
Depth of flow =   0.701(Ft.), Average velocity =   7.457(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    8.06(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1291.000(Ft.)
End of street segment elevation =  1242.000(Ft.)
Length of street segment  =  1677.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    239.797(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.203(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   13.47(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   9.20(Ft/s)
Travel time =    3.04 min.     TC =   14.82  min.
 Adding area flow to street
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) = 0.5200     Max loss rate(Fm)=     0.508(In/Hr)
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
Subarea runoff =    218.627(CFS) for  100.500(Ac.)
Total runoff =    349.052(CFS)
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```
Effective area this stream =      143.80(Ac.)
Total Study Area (Main Stream No. 1) =      143.80(Ac.)
Area averaged Fm value =    0.427(In/Hr)
Street flow at end of street =    349.052(CFS)
Half street flow at end of street =    174.526(CFS)
Depth of flow =   0.940(Ft.), Average velocity =  10.695(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   17.59(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1242.000(Ft.)
End of street segment elevation =  1202.000(Ft.)
Length of street segment  =  2393.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    473.053(CFS)
Depth of flow =   1.153(Ft.), Average velocity =  10.214(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   26.13(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =  10.21(Ft/s)
Travel time =    3.90 min.     TC =   18.72  min.
 Adding area flow to street
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) = 0.5400     Max loss rate(Fm)=     0.528(In/Hr)
Rainfall intensity =      2.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.741
Subarea runoff =    247.833(CFS) for  152.800(Ac.)
Total runoff =    596.886(CFS)
Effective area this stream =      296.60(Ac.)
Total Study Area (Main Stream No. 1) =      296.60(Ac.)
Area averaged Fm value =    0.479(In/Hr)
Street flow at end of street =    596.886(CFS)
Half street flow at end of street =    298.443(CFS)
Depth of flow =   1.262(Ft.), Average velocity =  11.210(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   30.47(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      105.000 to Point/Station      106.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1202.000(Ft.)
End of street segment elevation =  1194.000(Ft.)
Length of street segment  =  2317.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
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Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    673.675(CFS)
Depth of flow =   1.866(Ft.), Average velocity =   7.331(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   54.62(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   7.33(Ft/s)
Travel time =    5.27 min.     TC =   23.99  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 35.36
Pervious ratio(Ap) = 0.6100     Max loss rate(Fm)=     0.583(In/Hr)
Rainfall intensity =      2.340(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.702
Subarea runoff =    153.460(CFS) for  160.400(Ac.)
Total runoff =    750.345(CFS)
Effective area this stream =      457.00(Ac.)
Total Study Area (Main Stream No. 1) =      457.00(Ac.)
Area averaged Fm value =    0.516(In/Hr)
Street flow at end of street =    750.345(CFS)
Half street flow at end of street =    375.173(CFS)
Depth of flow =   1.962(Ft.), Average velocity =   7.654(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   58.46(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      106.000 to Point/Station      107.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1194.000(Ft.)
Downstream point elevation =  1166.000(Ft.)
Channel length thru subarea  =  2722.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =    773.416(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =    773.416(CFS)
Depth of flow =   2.943(Ft.), Average velocity =   8.271(Ft/s)
Channel flow top width =   43.546(Ft.)
Flow Velocity =    8.27(Ft/s)
Travel time  =    5.49 min.
Time of concentration =   29.48 min.
Critical depth =      2.938(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 33.50
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.581(In/Hr)
Rainfall intensity =      2.068(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.670
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Subarea runoff =     46.052(CFS) for  118.000(Ac.)
Total runoff =    796.397(CFS)
Effective area this stream =      575.00(Ac.)
Total Study Area (Main Stream No. 1) =      575.00(Ac.)
Area averaged Fm value =    0.529(In/Hr)
Depth of flow =   2.988(Ft.), Average velocity =   8.340(Ft/s)
Critical depth =      2.969(Ft.)


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Process from Point/Station      107.000 to Point/Station      108.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1166.000(Ft.)
Downstream point elevation =  1142.000(Ft.)
Channel length thru subarea  =  2918.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1036.487(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1036.487(CFS)
Depth of flow =   3.625(Ft.), Average velocity =   8.289(Ft/s)
Channel flow top width =   48.997(Ft.)
Flow Velocity =    8.29(Ft/s)
Travel time  =    5.87 min.
Time of concentration =   35.34 min.
Critical depth =      3.438(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.38
Pervious ratio(Ap) = 0.4100     Max loss rate(Fm)=     0.400(In/Hr)
Rainfall intensity =      1.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.671
Subarea runoff =    480.092(CFS) for  451.100(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1026.10(Ac.)
Total Study Area (Main Stream No. 1) =     1026.10(Ac.)
Area averaged Fm value =    0.472(In/Hr)
Depth of flow =   4.022(Ft.), Average velocity =   8.795(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)


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Process from Point/Station      108.000 to Point/Station      109.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1142.000(Ft.)
Downstream point elevation =  1104.000(Ft.)
Channel length thru subarea  =  5404.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1276.517(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1276.517(CFS)
Depth of flow =   4.156(Ft.), Average velocity =   8.391(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   52.000(Ft.)
Flow Velocity =    8.39(Ft/s)
Travel time  =   10.73 min.
Time of concentration =   46.08 min.
Critical depth =      3.875(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
```

```
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)
The area added to the existing stream causes a
a lower flow rate of Q =   1129.363(CFS)
therefore the upstream flow rate of Q =   1276.489(CFS) is being used
Rainfall intensity =      1.582(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.638
Subarea runoff =      0.000(CFS) for   92.500(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1118.60(Ac.)
Total Study Area (Main Stream No. 1) =     1118.60(Ac.)
Area averaged Fm value =    0.460(In/Hr)
Depth of flow =   4.156(Ft.), Average velocity =   8.391(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)


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Process from Point/Station      109.000 to Point/Station      110.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1104.000(Ft.)
Downstream point elevation =  1060.000(Ft.)
Channel length thru subarea  =  4941.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1377.016(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1377.016(CFS)
Depth of flow =   4.083(Ft.), Average velocity =   9.284(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   52.000(Ft.)
Flow Velocity =    9.28(Ft/s)
Travel time  =    8.87 min.
Time of concentration =   54.95 min.
Critical depth =      4.031(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
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) = 0.2700     Max loss rate(Fm)=     0.264(In/Hr)
Rainfall intensity =      1.423(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.647
Subarea runoff =    200.994(CFS) for  486.700(Ac.)
Total runoff =   1477.483(CFS)
Effective area this stream =     1605.30(Ac.)
Total Study Area (Main Stream No. 1) =     1605.30(Ac.)
Area averaged Fm value =    0.401(In/Hr)
Depth of flow =   4.206(Ft.), Average velocity =   9.549(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      4.156(Ft.)
End of computations, Total Study Area =         1605.30 (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) = 0.412
Area averaged SCS curve number =  32.6
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APPENDIX A.4: RATIONAL METHOD ANALYSIS, NODE 111

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: 04/16/20

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR RATIONAL TABLING METHOD
FN: ARA111.RSB

Program License Serial Number 6269

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

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.350 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 2

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Process from Point/Station 101.000 to Point/Station 102.000
**** 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) = 0.4200 Max loss rate(Fm)= 0.411(In/Hr)
Initial subarea data:
Initial area flow distance = 534.000(Ft.)
Top (of initial area) elevation = 1334.000(Ft.)
Bottom (of initial area) elevation = 1318.000(Ft.)
Difference in elevation = 16.000(Ft.)
Slope = 0.02996 s(%)= 3.00
TC = k(0.378)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 9.403 min.
Rainfall intensity = 4.104(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.810
Subarea runoff = 16.955(CFS)
Total initial stream area = 5.100(Ac.)
Pervious area fraction = 0.420
Initial area Fm value = 0.411(In/Hr)

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Process from Point/Station 102.000 to Point/Station 103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1318.000(Ft.)
End of street segment elevation = 1291.000(Ft.)
Length of street segment = 898.000(Ft.)
Height of curb above gutter flowline = 6.0(In.)
Width of half street (curb to crown) = 22.000(Ft.)
Distance from crown to crossfall grade break = 18.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.020
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line = 10.000(Ft.)
Slope from curb to property line (v/hz) = 0.025
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0150
Manning's N from gutter to grade break = 0.0150

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 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     73.754(CFS)
Depth of flow =   0.599(Ft.), Average velocity =   6.291(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.94(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   6.29(Ft/s)
Travel time =    2.38 min.     TC =   11.78  min.
 Adding area flow to street
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) = 0.2200     Max loss rate(Fm)=     0.215(In/Hr)
Rainfall intensity =      3.585(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.840
Subarea runoff =    113.470(CFS) for   38.200(Ac.)
Total runoff =    130.425(CFS)
Effective area this stream =       43.30(Ac.)
Total Study Area (Main Stream No. 1) =       43.30(Ac.)
Area averaged Fm value =    0.238(In/Hr)
Street flow at end of street =    130.425(CFS)
Half street flow at end of street =     65.212(CFS)
Depth of flow =   0.701(Ft.), Average velocity =   7.457(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    8.06(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      103.000 to Point/Station      104.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1291.000(Ft.)
End of street segment elevation =  1242.000(Ft.)
Length of street segment  =  1677.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    239.797(CFS)
Depth of flow =   0.837(Ft.), Average velocity =   9.203(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   13.47(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   9.20(Ft/s)
Travel time =    3.04 min.     TC =   14.82  min.
 Adding area flow to street
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) = 0.5200     Max loss rate(Fm)=     0.508(In/Hr)
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.777
Subarea runoff =    218.627(CFS) for  100.500(Ac.)
Total runoff =    349.052(CFS)
```

```
Effective area this stream =      143.80(Ac.)
Total Study Area (Main Stream No. 1) =      143.80(Ac.)
Area averaged Fm value =    0.427(In/Hr)
Street flow at end of street =    349.052(CFS)
Half street flow at end of street =    174.526(CFS)
Depth of flow =   0.940(Ft.), Average velocity =  10.695(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   17.59(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


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Process from Point/Station      104.000 to Point/Station      105.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1242.000(Ft.)
End of street segment elevation =  1202.000(Ft.)
Length of street segment  =  2393.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    473.053(CFS)
Depth of flow =   1.153(Ft.), Average velocity =  10.214(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   26.13(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =  10.21(Ft/s)
Travel time =    3.90 min.     TC =   18.72  min.
 Adding area flow to street
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) = 0.5400     Max loss rate(Fm)=     0.528(In/Hr)
Rainfall intensity =      2.715(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.741
Subarea runoff =    247.833(CFS) for  152.800(Ac.)
Total runoff =    596.886(CFS)
Effective area this stream =      296.60(Ac.)
Total Study Area (Main Stream No. 1) =      296.60(Ac.)
Area averaged Fm value =    0.479(In/Hr)
Street flow at end of street =    596.886(CFS)
Half street flow at end of street =    298.443(CFS)
Depth of flow =   1.262(Ft.), Average velocity =  11.210(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   30.47(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1202.000(Ft.)
End of street segment elevation =  1194.000(Ft.)
Length of street segment  =  2317.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
```

```
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =    673.675(CFS)
Depth of flow =   1.866(Ft.), Average velocity =   7.331(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   54.62(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   7.33(Ft/s)
Travel time =    5.27 min.     TC =   23.99  min.
 Adding area flow to street
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 35.36
Pervious ratio(Ap) = 0.6100     Max loss rate(Fm)=     0.583(In/Hr)
Rainfall intensity =      2.340(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.702
Subarea runoff =    153.460(CFS) for  160.400(Ac.)
Total runoff =    750.345(CFS)
Effective area this stream =      457.00(Ac.)
Total Study Area (Main Stream No. 1) =      457.00(Ac.)
Area averaged Fm value =    0.516(In/Hr)
Street flow at end of street =    750.345(CFS)
Half street flow at end of street =    375.173(CFS)
Depth of flow =   1.962(Ft.), Average velocity =   7.654(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =   58.46(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** IMPROVED CHANNEL TRAVEL TIME ****
------------------------------------------------------------------------
Upstream point elevation =  1194.000(Ft.)
Downstream point elevation =  1166.000(Ft.)
Channel length thru subarea  =  2722.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =    773.416(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =    773.416(CFS)
Depth of flow =   2.943(Ft.), Average velocity =   8.271(Ft/s)
Channel flow top width =   43.546(Ft.)
Flow Velocity =    8.27(Ft/s)
Travel time  =    5.49 min.
Time of concentration =   29.48 min.
Critical depth =      2.938(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 33.50
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.581(In/Hr)
Rainfall intensity =      2.068(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.670
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Subarea runoff =     46.052(CFS) for  118.000(Ac.)
Total runoff =    796.397(CFS)
Effective area this stream =      575.00(Ac.)
Total Study Area (Main Stream No. 1) =      575.00(Ac.)
Area averaged Fm value =    0.529(In/Hr)
Depth of flow =   2.988(Ft.), Average velocity =   8.340(Ft/s)
Critical depth =      2.969(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1166.000(Ft.)
Downstream point elevation =  1142.000(Ft.)
Channel length thru subarea  =  2918.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1036.487(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1036.487(CFS)
Depth of flow =   3.625(Ft.), Average velocity =   8.289(Ft/s)
Channel flow top width =   48.997(Ft.)
Flow Velocity =    8.29(Ft/s)
Travel time  =    5.87 min.
Time of concentration =   35.34 min.
Critical depth =      3.438(Ft.)
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 32.38
Pervious ratio(Ap) = 0.4100     Max loss rate(Fm)=     0.400(In/Hr)
Rainfall intensity =      1.855(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.671
Subarea runoff =    480.092(CFS) for  451.100(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1026.10(Ac.)
Total Study Area (Main Stream No. 1) =     1026.10(Ac.)
Area averaged Fm value =    0.472(In/Hr)
Depth of flow =   4.022(Ft.), Average velocity =   8.795(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      109.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1142.000(Ft.)
Downstream point elevation =  1104.000(Ft.)
Channel length thru subarea  =  5404.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1276.517(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1276.517(CFS)
Depth of flow =   4.156(Ft.), Average velocity =   8.391(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   52.000(Ft.)
Flow Velocity =    8.39(Ft/s)
Travel time  =   10.73 min.
Time of concentration =   46.08 min.
Critical depth =      3.875(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
```

```
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)
The area added to the existing stream causes a
a lower flow rate of Q =   1129.363(CFS)
therefore the upstream flow rate of Q =   1276.489(CFS) is being used
Rainfall intensity =      1.582(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.638
Subarea runoff =      0.000(CFS) for   92.500(Ac.)
Total runoff =   1276.489(CFS)
Effective area this stream =     1118.60(Ac.)
Total Study Area (Main Stream No. 1) =     1118.60(Ac.)
Area averaged Fm value =    0.460(In/Hr)
Depth of flow =   4.156(Ft.), Average velocity =   8.391(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      3.875(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1104.000(Ft.)
Downstream point elevation =  1060.000(Ft.)
Channel length thru subarea  =  4941.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1377.016(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1377.016(CFS)
Depth of flow =   4.083(Ft.), Average velocity =   9.284(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   52.000(Ft.)
Flow Velocity =    9.28(Ft/s)
Travel time  =    8.87 min.
Time of concentration =   54.95 min.
Critical depth =      4.031(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
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) = 0.2700     Max loss rate(Fm)=     0.264(In/Hr)
Rainfall intensity =      1.423(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.647
Subarea runoff =    200.994(CFS) for  486.700(Ac.)
Total runoff =   1477.483(CFS)
Effective area this stream =     1605.30(Ac.)
Total Study Area (Main Stream No. 1) =     1605.30(Ac.)
Area averaged Fm value =    0.401(In/Hr)
Depth of flow =   4.206(Ft.), Average velocity =   9.549(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      4.156(Ft.)


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Process from Point/Station      110.000 to Point/Station      111.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1060.000(Ft.)
Downstream point elevation =  1036.000(Ft.)
Channel length thru subarea  =  4312.000(Ft.)
Channel base width     =   20.000(Ft.)
Slope or 'Z' of left channel bank =   4.000
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```
Slope or 'Z' of right channel bank =   4.000
Estimated mean flow rate at midpoint of channel =   1477.515(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    4.000(Ft.)
Flow(q) thru subarea =   1477.515(CFS)
Depth of flow =   4.657(Ft.), Average velocity =   8.294(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   52.000(Ft.)
Flow Velocity =    8.29(Ft/s)
Travel time  =    8.67 min.
Time of concentration =   63.61 min.
Critical depth =      4.156(Ft.)
ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
Soil classification AP and SCS  values input by user
USER INPUT of soil data for subarea
SCS curve number for soil(AMC 2)  = 34.99
Pervious ratio(Ap) = 0.5100     Max loss rate(Fm)=     0.489(In/Hr)
The area added to the existing stream causes a
a lower flow rate of Q =   1408.366(CFS)
therefore the upstream flow rate of Q =   1477.483(CFS) is being used
Rainfall intensity =      1.303(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.619
Subarea runoff =      0.000(CFS) for  141.600(Ac.)
Total runoff =   1477.483(CFS)
Effective area this stream =     1746.90(Ac.)
Total Study Area (Main Stream No. 1) =     1746.90(Ac.)
Area averaged Fm value =    0.408(In/Hr)
Depth of flow =   4.657(Ft.), Average velocity =   8.294(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      4.156(Ft.)
End of computations, Total Study Area =         1746.90 (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) = 0.420
Area averaged SCS curve number =  32.8
```

APPENDIX B: ULTIMATE CONDITION UNIT HYDROGRAPH ANALYSES

APPENDIX B.1: UNIT HYDROGRAPH METHOD ANALYSIS, NODE 108

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 04/20/20

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

Program License Serial Number 6269

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR UNIT HYDROGRAPH METHOD
FN:ARA108UH24.UBM

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
1026.10	1	1.35
Rainfall data for year 100		
1026.10	6	2.84
Rainfall data for year 100		
1026.10	24	5.42

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.9	32.9	1026.10	1.000	0.972	0.486	0.473

Area-averaged adjusted loss rate Fm (In/Hr) = 0.473

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
498.68	0.486	32.9	32.9	20.40	0.015
527.42	0.514	98.0	98.0	0.20	0.956

Area-averaged catchment yield fraction, Y = 0.499
Area-averaged low loss fraction, Yb = 0.501
User entry of time of concentration = 0.589 (hours)

++

Watershed area = 1026.10(Ac.)
Catchment Lag time = 0.471 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 17.6853
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.473(In/Hr)
Average low loss rate fraction (Yb) = 0.501 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.500(In)
Computed peak 30-minute rainfall = 1.023(In)
Specified peak 1-hour rainfall = 1.350(In)
Computed peak 3-hour rainfall = 2.130(In)
Specified peak 6-hour rainfall = 2.840(In)
Specified peak 24-hour rainfall = 5.420(In)

Rainfall depth area reduction factors:
Using a total area of 1026.10(Ac.) (Ref: fig. E-4)

5-minute factor = 0.952 Adjusted rainfall = 0.476(In)
30-minute factor = 0.952 Adjusted rainfall = 0.974(In)
1-hour factor = 0.952 Adjusted rainfall = 1.285(In)
3-hour factor = 0.994 Adjusted rainfall = 2.117(In)
6-hour factor = 0.997 Adjusted rainfall = 2.831(In)
24-hour factor = 0.999 Adjusted rainfall = 5.413(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 = 12409.40 (CFS))	
1	1.031	127.915
2	3.950	362.233
3	10.413	802.068
4	20.427	1242.611
5	32.386	1484.132
6	47.032	1817.404
7	62.914	1970.871
8	74.790	1473.721
9	82.611	970.524
10	88.875	777.352
11	92.383	435.371
12	95.161	344.714
13	96.900	215.834
14	97.995	135.826
15	98.416	52.242
16	98.734	39.508
17	99.053	39.505
18	99.371	39.489
19	99.689	39.506
20	100.000	38.571

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4756	0.4756
2	0.6276	0.1520
3	0.7381	0.1105
4	0.8281	0.0900
5	0.9054	0.0773
6	0.9739	0.0685
7	1.0358	0.0619
8	1.0927	0.0568
9	1.1454	0.0527
10	1.1947	0.0493
11	1.2411	0.0464
12	1.2851	0.0440
13	1.3327	0.0476
14	1.3783	0.0456

15	1.4222	0.0439
16	1.4645	0.0423
17	1.5054	0.0409
18	1.5450	0.0396
19	1.5835	0.0384
20	1.6208	0.0373
21	1.6571	0.0363
22	1.6925	0.0354
23	1.7271	0.0345
24	1.7608	0.0337
25	1.7937	0.0330
26	1.8260	0.0323
27	1.8576	0.0316
28	1.8885	0.0310
29	1.9189	0.0304
30	1.9487	0.0298
31	1.9779	0.0293
32	2.0067	0.0287
33	2.0349	0.0283
34	2.0627	0.0278
35	2.0901	0.0273
36	2.1170	0.0269
37	2.1414	0.0245
38	2.1655	0.0241
39	2.1892	0.0237
40	2.2126	0.0234
41	2.2356	0.0230
42	2.2583	0.0227
43	2.2807	0.0224
44	2.3028	0.0221
45	2.3246	0.0218
46	2.3461	0.0215
47	2.3674	0.0212
48	2.3883	0.0210
49	2.4091	0.0207
50	2.4296	0.0205
51	2.4498	0.0203
52	2.4699	0.0200
53	2.4897	0.0198
54	2.5092	0.0196
55	2.5286	0.0194
56	2.5478	0.0192
57	2.5668	0.0190
58	2.5856	0.0188
59	2.6042	0.0186
60	2.6226	0.0184
61	2.6408	0.0182
62	2.6589	0.0181
63	2.6768	0.0179
64	2.6945	0.0177
65	2.7121	0.0176
66	2.7295	0.0174
67	2.7467	0.0173
68	2.7639	0.0171
69	2.7808	0.0170
70	2.7977	0.0168
71	2.8143	0.0167
72	2.8309	0.0166
73	2.8492	0.0183
74	2.8674	0.0182
75	2.8854	0.0181
76	2.9034	0.0179
77	2.9212	0.0178
78	2.9389	0.0177
79	2.9564	0.0176
80	2.9739	0.0174
81	2.9912	0.0173
82	3.0084	0.0172
83	3.0255	0.0171
84	3.0425	0.0170
85	3.0594	0.0169

86	3.0761	0.0168
87	3.0928	0.0167
88	3.1094	0.0166
89	3.1259	0.0165
90	3.1422	0.0164
91	3.1585	0.0163
92	3.1747	0.0162
93	3.1908	0.0161
94	3.2068	0.0160
95	3.2227	0.0159
96	3.2385	0.0158
97	3.2542	0.0157
98	3.2699	0.0156
99	3.2854	0.0156
100	3.3009	0.0155
101	3.3163	0.0154
102	3.3316	0.0153
103	3.3469	0.0152
104	3.3620	0.0152
105	3.3771	0.0151
106	3.3921	0.0150
107	3.4070	0.0149
108	3.4219	0.0149
109	3.4366	0.0148
110	3.4513	0.0147
111	3.4660	0.0146
112	3.4805	0.0146
113	3.4950	0.0145
114	3.5095	0.0144
115	3.5238	0.0144
116	3.5381	0.0143
117	3.5524	0.0142
118	3.5665	0.0142
119	3.5806	0.0141
120	3.5947	0.0140
121	3.6086	0.0140
122	3.6226	0.0139
123	3.6364	0.0139
124	3.6502	0.0138
125	3.6639	0.0137
126	3.6776	0.0137
127	3.6912	0.0136
128	3.7048	0.0136
129	3.7183	0.0135
130	3.7318	0.0135
131	3.7451	0.0134
132	3.7585	0.0133
133	3.7718	0.0133
134	3.7850	0.0132
135	3.7982	0.0132
136	3.8113	0.0131
137	3.8244	0.0131
138	3.8374	0.0130
139	3.8504	0.0130
140	3.8633	0.0129
141	3.8762	0.0129
142	3.8890	0.0128
143	3.9018	0.0128
144	3.9146	0.0127
145	3.9272	0.0127
146	3.9399	0.0126
147	3.9525	0.0126
148	3.9650	0.0125
149	3.9775	0.0125
150	3.9900	0.0125
151	4.0024	0.0124
152	4.0148	0.0124
153	4.0271	0.0123
154	4.0394	0.0123
155	4.0516	0.0122
156	4.0638	0.0122

157	4.0760	0.0122
158	4.0881	0.0121
159	4.1002	0.0121
160	4.1122	0.0120
161	4.1242	0.0120
162	4.1362	0.0120
163	4.1481	0.0119
164	4.1600	0.0119
165	4.1718	0.0118
166	4.1836	0.0118
167	4.1954	0.0118
168	4.2071	0.0117
169	4.2188	0.0117
170	4.2305	0.0117
171	4.2421	0.0116
172	4.2537	0.0116
173	4.2652	0.0115
174	4.2767	0.0115
175	4.2882	0.0115
176	4.2997	0.0114
177	4.3111	0.0114
178	4.3224	0.0114
179	4.3338	0.0113
180	4.3451	0.0113
181	4.3563	0.0113
182	4.3676	0.0112
183	4.3788	0.0112
184	4.3900	0.0112
185	4.4011	0.0111
186	4.4122	0.0111
187	4.4233	0.0111
188	4.4343	0.0110
189	4.4453	0.0110
190	4.4563	0.0110
191	4.4673	0.0110
192	4.4782	0.0109
193	4.4891	0.0109
194	4.4999	0.0109
195	4.5108	0.0108
196	4.5216	0.0108
197	4.5324	0.0108
198	4.5431	0.0107
199	4.5538	0.0107
200	4.5645	0.0107
201	4.5752	0.0107
202	4.5858	0.0106
203	4.5964	0.0106
204	4.6070	0.0106
205	4.6175	0.0105
206	4.6280	0.0105
207	4.6385	0.0105
208	4.6490	0.0105
209	4.6594	0.0104
210	4.6698	0.0104
211	4.6802	0.0104
212	4.6906	0.0104
213	4.7009	0.0103
214	4.7112	0.0103
215	4.7215	0.0103
216	4.7317	0.0103
217	4.7420	0.0102
218	4.7522	0.0102
219	4.7624	0.0102
220	4.7725	0.0102
221	4.7827	0.0101
222	4.7928	0.0101
223	4.8028	0.0101
224	4.8129	0.0101
225	4.8229	0.0100
226	4.8329	0.0100
227	4.8429	0.0100

228	4.8529	0.0100
229	4.8628	0.0099
230	4.8728	0.0099
231	4.8827	0.0099
232	4.8925	0.0099
233	4.9024	0.0098
234	4.9122	0.0098
235	4.9220	0.0098
236	4.9318	0.0098
237	4.9415	0.0098
238	4.9513	0.0097
239	4.9610	0.0097
240	4.9707	0.0097
241	4.9804	0.0097
242	4.9900	0.0097
243	4.9997	0.0096
244	5.0093	0.0096
245	5.0189	0.0096
246	5.0284	0.0096
247	5.0380	0.0095
248	5.0475	0.0095
249	5.0570	0.0095
250	5.0665	0.0095
251	5.0760	0.0095
252	5.0854	0.0094
253	5.0948	0.0094
254	5.1042	0.0094
255	5.1136	0.0094
256	5.1230	0.0094
257	5.1323	0.0093
258	5.1417	0.0093
259	5.1510	0.0093
260	5.1603	0.0093
261	5.1695	0.0093
262	5.1788	0.0093
263	5.1880	0.0092
264	5.1972	0.0092
265	5.2064	0.0092
266	5.2156	0.0092
267	5.2248	0.0092
268	5.2339	0.0091
269	5.2430	0.0091
270	5.2521	0.0091
271	5.2612	0.0091
272	5.2703	0.0091
273	5.2793	0.0091
274	5.2884	0.0090
275	5.2974	0.0090
276	5.3064	0.0090
277	5.3154	0.0090
278	5.3243	0.0090
279	5.3333	0.0089
280	5.3422	0.0089
281	5.3511	0.0089
282	5.3600	0.0089
283	5.3689	0.0089
284	5.3778	0.0089
285	5.3866	0.0088
286	5.3954	0.0088
287	5.4043	0.0088
288	5.4130	0.0088

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0088	0.0044	0.0044
2	0.0088	0.0044	0.0044
3	0.0088	0.0044	0.0044
4	0.0089	0.0044	0.0044
5	0.0089	0.0045	0.0044

6	0.0089	0.0045	0.0044
7	0.0089	0.0045	0.0045
8	0.0090	0.0045	0.0045
9	0.0090	0.0045	0.0045
10	0.0090	0.0045	0.0045
11	0.0091	0.0045	0.0045
12	0.0091	0.0045	0.0045
13	0.0091	0.0046	0.0045
14	0.0091	0.0046	0.0046
15	0.0092	0.0046	0.0046
16	0.0092	0.0046	0.0046
17	0.0092	0.0046	0.0046
18	0.0092	0.0046	0.0046
19	0.0093	0.0046	0.0046
20	0.0093	0.0047	0.0046
21	0.0093	0.0047	0.0047
22	0.0093	0.0047	0.0047
23	0.0094	0.0047	0.0047
24	0.0094	0.0047	0.0047
25	0.0094	0.0047	0.0047
26	0.0095	0.0047	0.0047
27	0.0095	0.0048	0.0047
28	0.0095	0.0048	0.0048
29	0.0096	0.0048	0.0048
30	0.0096	0.0048	0.0048
31	0.0096	0.0048	0.0048
32	0.0097	0.0048	0.0048
33	0.0097	0.0049	0.0048
34	0.0097	0.0049	0.0048
35	0.0098	0.0049	0.0049
36	0.0098	0.0049	0.0049
37	0.0098	0.0049	0.0049
38	0.0098	0.0049	0.0049
39	0.0099	0.0050	0.0049
40	0.0099	0.0050	0.0049
41	0.0100	0.0050	0.0050
42	0.0100	0.0050	0.0050
43	0.0100	0.0050	0.0050
44	0.0101	0.0050	0.0050
45	0.0101	0.0051	0.0050
46	0.0101	0.0051	0.0051
47	0.0102	0.0051	0.0051
48	0.0102	0.0051	0.0051
49	0.0103	0.0051	0.0051
50	0.0103	0.0052	0.0051
51	0.0103	0.0052	0.0052
52	0.0104	0.0052	0.0052
53	0.0104	0.0052	0.0052
54	0.0104	0.0052	0.0052
55	0.0105	0.0053	0.0052
56	0.0105	0.0053	0.0052
57	0.0106	0.0053	0.0053
58	0.0106	0.0053	0.0053
59	0.0107	0.0053	0.0053
60	0.0107	0.0054	0.0053
61	0.0107	0.0054	0.0054
62	0.0108	0.0054	0.0054
63	0.0108	0.0054	0.0054
64	0.0109	0.0054	0.0054
65	0.0109	0.0055	0.0054
66	0.0110	0.0055	0.0055
67	0.0110	0.0055	0.0055
68	0.0110	0.0055	0.0055
69	0.0111	0.0056	0.0055
70	0.0111	0.0056	0.0056
71	0.0112	0.0056	0.0056
72	0.0112	0.0056	0.0056
73	0.0113	0.0057	0.0056
74	0.0113	0.0057	0.0057
75	0.0114	0.0057	0.0057
76	0.0114	0.0057	0.0057

77	0.0115	0.0058	0.0057
78	0.0115	0.0058	0.0058
79	0.0116	0.0058	0.0058
80	0.0117	0.0058	0.0058
81	0.0117	0.0059	0.0059
82	0.0118	0.0059	0.0059
83	0.0118	0.0059	0.0059
84	0.0119	0.0060	0.0059
85	0.0120	0.0060	0.0060
86	0.0120	0.0060	0.0060
87	0.0121	0.0061	0.0060
88	0.0121	0.0061	0.0060
89	0.0122	0.0061	0.0061
90	0.0122	0.0061	0.0061
91	0.0123	0.0062	0.0062
92	0.0124	0.0062	0.0062
93	0.0125	0.0062	0.0062
94	0.0125	0.0063	0.0062
95	0.0126	0.0063	0.0063
96	0.0126	0.0063	0.0063
97	0.0127	0.0064	0.0064
98	0.0128	0.0064	0.0064
99	0.0129	0.0065	0.0064
100	0.0129	0.0065	0.0064
101	0.0130	0.0065	0.0065
102	0.0131	0.0066	0.0065
103	0.0132	0.0066	0.0066
104	0.0132	0.0066	0.0066
105	0.0133	0.0067	0.0067
106	0.0134	0.0067	0.0067
107	0.0135	0.0068	0.0067
108	0.0136	0.0068	0.0068
109	0.0137	0.0069	0.0068
110	0.0137	0.0069	0.0069
111	0.0139	0.0069	0.0069
112	0.0139	0.0070	0.0069
113	0.0140	0.0070	0.0070
114	0.0141	0.0071	0.0070
115	0.0142	0.0071	0.0071
116	0.0143	0.0072	0.0071
117	0.0144	0.0072	0.0072
118	0.0145	0.0073	0.0072
119	0.0146	0.0073	0.0073
120	0.0147	0.0074	0.0073
121	0.0149	0.0074	0.0074
122	0.0149	0.0075	0.0074
123	0.0151	0.0076	0.0075
124	0.0152	0.0076	0.0076
125	0.0153	0.0077	0.0076
126	0.0154	0.0077	0.0077
127	0.0156	0.0078	0.0078
128	0.0156	0.0078	0.0078
129	0.0158	0.0079	0.0079
130	0.0159	0.0080	0.0079
131	0.0161	0.0081	0.0080
132	0.0162	0.0081	0.0081
133	0.0164	0.0082	0.0082
134	0.0165	0.0083	0.0082
135	0.0167	0.0084	0.0083
136	0.0168	0.0084	0.0084
137	0.0170	0.0085	0.0085
138	0.0171	0.0086	0.0085
139	0.0173	0.0087	0.0086
140	0.0174	0.0087	0.0087
141	0.0177	0.0089	0.0088
142	0.0178	0.0089	0.0089
143	0.0181	0.0090	0.0090
144	0.0182	0.0091	0.0091
145	0.0166	0.0083	0.0083
146	0.0167	0.0084	0.0083
147	0.0170	0.0085	0.0085

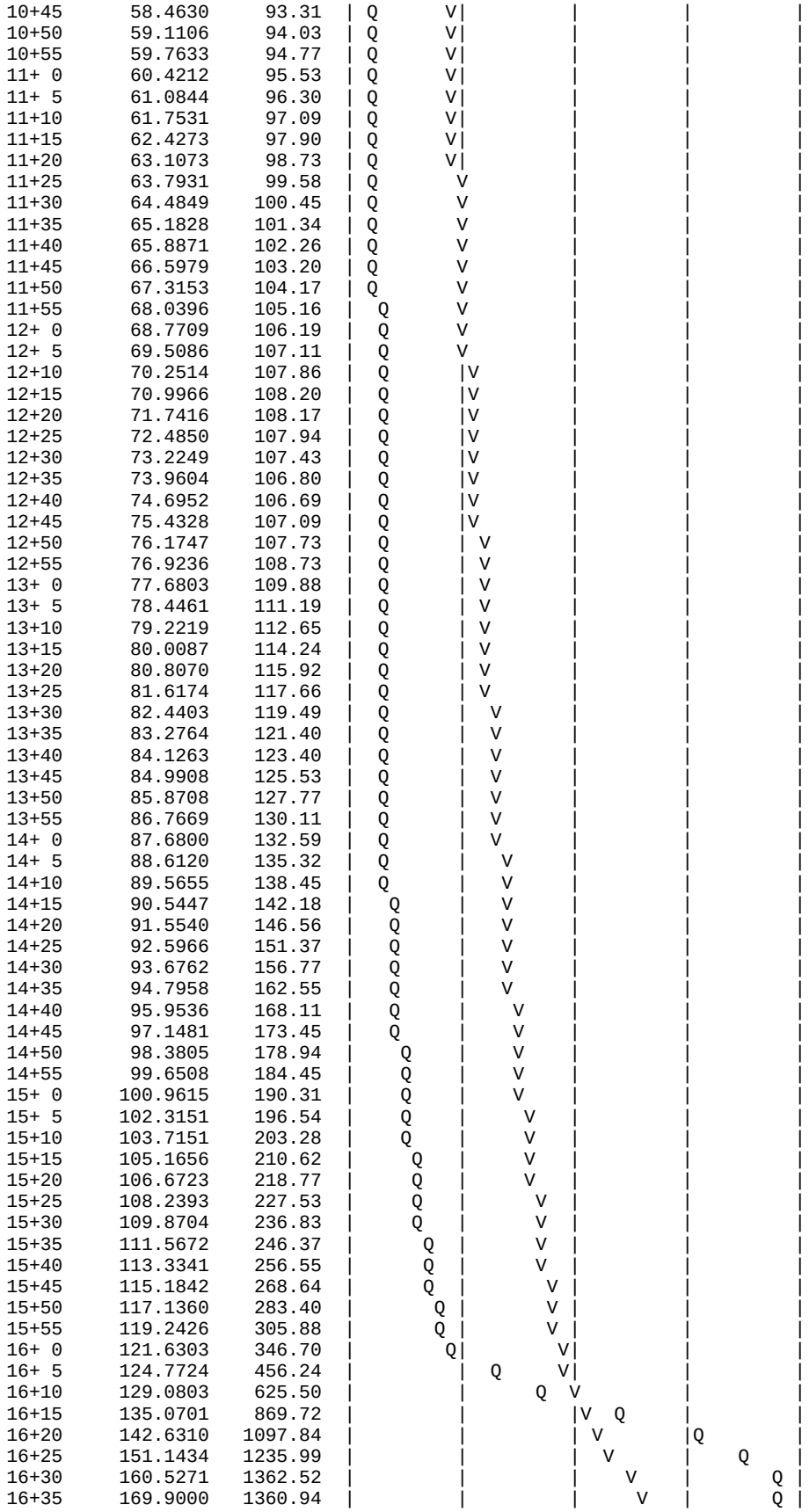
148	0.0171	0.0086	0.0085
149	0.0174	0.0087	0.0087
150	0.0176	0.0088	0.0088
151	0.0179	0.0090	0.0089
152	0.0181	0.0091	0.0090
153	0.0184	0.0092	0.0092
154	0.0186	0.0093	0.0093
155	0.0190	0.0095	0.0095
156	0.0192	0.0096	0.0096
157	0.0196	0.0098	0.0098
158	0.0198	0.0099	0.0099
159	0.0203	0.0101	0.0101
160	0.0205	0.0103	0.0102
161	0.0210	0.0105	0.0105
162	0.0212	0.0106	0.0106
163	0.0218	0.0109	0.0109
164	0.0221	0.0111	0.0110
165	0.0227	0.0114	0.0113
166	0.0230	0.0115	0.0115
167	0.0237	0.0119	0.0118
168	0.0241	0.0121	0.0120
169	0.0269	0.0135	0.0134
170	0.0273	0.0137	0.0136
171	0.0283	0.0142	0.0141
172	0.0287	0.0144	0.0143
173	0.0298	0.0149	0.0149
174	0.0304	0.0152	0.0151
175	0.0316	0.0158	0.0158
176	0.0323	0.0162	0.0161
177	0.0337	0.0169	0.0168
178	0.0345	0.0173	0.0172
179	0.0363	0.0182	0.0181
180	0.0373	0.0187	0.0186
181	0.0396	0.0198	0.0198
182	0.0409	0.0205	0.0204
183	0.0439	0.0220	0.0219
184	0.0456	0.0229	0.0228
185	0.0440	0.0220	0.0219
186	0.0464	0.0233	0.0232
187	0.0527	0.0264	0.0263
188	0.0568	0.0285	0.0284
189	0.0685	0.0343	0.0342
190	0.0773	0.0387	0.0386
191	0.1105	0.0394	0.0711
192	0.1520	0.0394	0.1126
193	0.4756	0.0394	0.4362
194	0.0900	0.0394	0.0506
195	0.0619	0.0310	0.0309
196	0.0493	0.0247	0.0246
197	0.0476	0.0239	0.0237
198	0.0423	0.0212	0.0211
199	0.0384	0.0193	0.0192
200	0.0354	0.0177	0.0177
201	0.0330	0.0165	0.0164
202	0.0310	0.0155	0.0154
203	0.0293	0.0147	0.0146
204	0.0278	0.0139	0.0139
205	0.0245	0.0123	0.0122
206	0.0234	0.0117	0.0117
207	0.0224	0.0112	0.0112
208	0.0215	0.0108	0.0107
209	0.0207	0.0104	0.0103
210	0.0200	0.0100	0.0100
211	0.0194	0.0097	0.0097
212	0.0188	0.0094	0.0094
213	0.0182	0.0091	0.0091
214	0.0177	0.0089	0.0088
215	0.0173	0.0087	0.0086
216	0.0168	0.0084	0.0084
217	0.0183	0.0092	0.0091
218	0.0179	0.0090	0.0089

219	0.0176	0.0088	0.0088
220	0.0172	0.0086	0.0086
221	0.0169	0.0085	0.0084
222	0.0166	0.0083	0.0083
223	0.0163	0.0082	0.0081
224	0.0160	0.0080	0.0080
225	0.0157	0.0079	0.0078
226	0.0155	0.0078	0.0077
227	0.0152	0.0076	0.0076
228	0.0150	0.0075	0.0075
229	0.0148	0.0074	0.0074
230	0.0146	0.0073	0.0073
231	0.0144	0.0072	0.0072
232	0.0142	0.0071	0.0071
233	0.0140	0.0070	0.0070
234	0.0138	0.0069	0.0069
235	0.0136	0.0068	0.0068
236	0.0135	0.0067	0.0067
237	0.0133	0.0067	0.0066
238	0.0131	0.0066	0.0066
239	0.0130	0.0065	0.0065
240	0.0128	0.0064	0.0064
241	0.0127	0.0064	0.0063
242	0.0125	0.0063	0.0063
243	0.0124	0.0062	0.0062
244	0.0123	0.0062	0.0061
245	0.0122	0.0061	0.0061
246	0.0120	0.0060	0.0060
247	0.0119	0.0060	0.0059
248	0.0118	0.0059	0.0059
249	0.0117	0.0059	0.0058
250	0.0116	0.0058	0.0058
251	0.0115	0.0058	0.0057
252	0.0114	0.0057	0.0057
253	0.0113	0.0056	0.0056
254	0.0112	0.0056	0.0056
255	0.0111	0.0056	0.0055
256	0.0110	0.0055	0.0055
257	0.0109	0.0055	0.0054
258	0.0108	0.0054	0.0054
259	0.0107	0.0054	0.0053
260	0.0106	0.0053	0.0053
261	0.0105	0.0053	0.0053
262	0.0105	0.0052	0.0052
263	0.0104	0.0052	0.0052
264	0.0103	0.0052	0.0051
265	0.0102	0.0051	0.0051
266	0.0102	0.0051	0.0051
267	0.0101	0.0051	0.0050
268	0.0100	0.0050	0.0050
269	0.0099	0.0050	0.0050
270	0.0099	0.0049	0.0049
271	0.0098	0.0049	0.0049
272	0.0097	0.0049	0.0049
273	0.0097	0.0048	0.0048
274	0.0096	0.0048	0.0048
275	0.0095	0.0048	0.0048
276	0.0095	0.0048	0.0047
277	0.0094	0.0047	0.0047
278	0.0094	0.0047	0.0047
279	0.0093	0.0047	0.0046
280	0.0093	0.0046	0.0046
281	0.0092	0.0046	0.0046
282	0.0091	0.0046	0.0046
283	0.0091	0.0046	0.0045
284	0.0090	0.0045	0.0045
285	0.0090	0.0045	0.0045
286	0.0089	0.0045	0.0045
287	0.0089	0.0044	0.0044
288	0.0088	0.0044	0.0044

```
      ----------------------------------------------------------------------
      Total soil rain loss =      2.46(In)
      Total effective rainfall =      2.96(In)
      Peak flow rate in flood hydrograph =   1362.52(CFS)
      ----------------------------------------------------------------------
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          24 - H O U R    S T O R M
                      R u n o f f      H y d r o g r a p h
      ----------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ----------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0      350.0     700.0    1050.0    1400.0
----------------------------------------------------------------------------
  0+ 5       0.0039      0.56  Q         |         |         |         |
  0+10       0.0187      2.15  Q         |         |         |         |
  0+15       0.0578      5.68  Q         |         |         |         |
  0+20       0.1345     11.14  Q         |         |         |         |
  0+25       0.2563     17.69  Q         |         |         |         |
  0+30       0.4334     25.71  Q         |         |         |         |
  0+35       0.6705     34.43  Q         |         |         |         |
  0+40       0.9528     40.99  VQ        |         |         |         |
  0+45       1.2652     45.36  VQ        |         |         |         |
  0+50       1.6019     48.90  VQ        |         |         |         |
  0+55       1.9528     50.95  VQ        |         |         |         |
  1+ 0       2.3151     52.60  VQ        |         |         |         |
  1+ 5       2.6849     53.70  VQ        |         |         |         |
  1+10       3.0599     54.45  VQ        |         |         |         |
  1+15       3.4376     54.84  VQ        |         |         |         |
  1+20       3.8176     55.17  VQ        |         |         |         |
  1+25       4.1998     55.51  VQ        |         |         |         |
  1+30       4.5844     55.84  VQ        |         |         |         |
  1+35       4.9714     56.18  VQ        |         |         |         |
  1+40       5.3606     56.52  VQ        |         |         |         |
  1+45       5.7510     56.69  VQ        |         |         |         |
  1+50       6.1426     56.86  VQ        |         |         |         |
  1+55       6.5354     57.03  |Q        |         |         |         |
  2+ 0       6.9293     57.20  |Q        |         |         |         |
  2+ 5       7.3245     57.38  |Q        |         |         |         |
  2+10       7.7209     57.56  |Q        |         |         |         |
  2+15       8.1185     57.73  |Q        |         |         |         |
  2+20       8.5173     57.91  |Q        |         |         |         |
  2+25       8.9174     58.09  |Q        |         |         |         |
  2+30       9.3188     58.28  |Q        |         |         |         |
  2+35       9.7214     58.46  |Q        |         |         |         |
  2+40      10.1253     58.65  |Q        |         |         |         |
  2+45      10.5305     58.84  |Q        |         |         |         |
  2+50      10.9371     59.03  |Q        |         |         |         |
  2+55      11.3449     59.22  |Q        |         |         |         |
  3+ 0      11.7541     59.41  |Q        |         |         |         |
  3+ 5      12.1646     59.61  |Q        |         |         |         |
  3+10      12.5765     59.80  |Q        |         |         |         |
  3+15      12.9897     60.00  |QV       |         |         |         |
  3+20      13.4043     60.20  |QV       |         |         |         |
  3+25      13.8204     60.41  |QV       |         |         |         |
  3+30      14.2378     60.61  |QV       |         |         |         |
  3+35      14.6567     60.82  |QV       |         |         |         |
  3+40      15.0770     61.03  |QV       |         |         |         |
  3+45      15.4987     61.24  |QV       |         |         |         |
  3+50      15.9219     61.45  |QV       |         |         |         |
  3+55      16.3466     61.67  |QV       |         |         |         |
  4+ 0      16.7728     61.89  |QV       |         |         |         |
  4+ 5      17.2006     62.10  |QV       |         |         |         |
  4+10      17.6298     62.33  |QV       |         |         |         |
  4+15      18.0606     62.55  |QV       |         |         |         |
  4+20      18.4930     62.78  |QV       |         |         |         |
  4+25      18.9269     63.01  |QV       |         |         |         |
  4+30      19.3624     63.24  |Q V      |         |         |         |
  4+35      19.7995     63.47  |Q V      |         |         |         |
  4+40      20.2383     63.71  |Q V      |         |         |         |
  4+45      20.6787     63.95  |Q V      |         |         |         |
```

4+50	21.1208	64.19	Q V			
4+55	21.5645	64.43	Q V			
5+ 0	22.0100	64.68	Q V			
5+ 5	22.4572	64.93	Q V			
5+10	22.9061	65.18	Q V			
5+15	23.3567	65.44	Q V			
5+20	23.8092	65.70	Q V			
5+25	24.2634	65.96	Q V			
5+30	24.7195	66.22	Q V			
5+35	25.1774	66.49	Q V			
5+40	25.6372	66.76	Q V			
5+45	26.0988	67.03	Q V			
5+50	26.5624	67.31	Q V			
5+55	27.0279	67.59	Q V			
6+ 0	27.4953	67.87	Q V			
6+ 5	27.9647	68.16	Q V			
6+10	28.4361	68.45	Q V			
6+15	28.9096	68.74	Q V			
6+20	29.3851	69.04	Q V			
6+25	29.8626	69.34	Q V			
6+30	30.3423	69.65	Q V			
6+35	30.8241	69.96	Q V			
6+40	31.3081	70.27	Q V			
6+45	31.7942	70.59	Q V			
6+50	32.2825	70.91	Q V			
6+55	32.7731	71.23	Q V			
7+ 0	33.2660	71.57	Q V			
7+ 5	33.7612	71.90	Q V			
7+10	34.2587	72.24	Q V			
7+15	34.7586	72.58	Q V			
7+20	35.2608	72.93	Q V			
7+25	35.7655	73.28	Q V			
7+30	36.2727	73.64	Q V			
7+35	36.7824	74.00	Q V			
7+40	37.2946	74.37	Q V			
7+45	37.8094	74.75	Q V			
7+50	38.3268	75.13	Q V			
7+55	38.8468	75.51	Q V			
8+ 0	39.3696	75.90	Q V			
8+ 5	39.8951	76.30	Q V			
8+10	40.4233	76.70	Q V			
8+15	40.9544	77.11	Q V			
8+20	41.4883	77.53	Q V			
8+25	42.0251	77.95	Q V			
8+30	42.5649	78.38	Q V			
8+35	43.1077	78.81	Q V			
8+40	43.6535	79.25	Q V			
8+45	44.2024	79.70	Q V			
8+50	44.7544	80.16	Q V			
8+55	45.3097	80.62	Q V			
9+ 0	45.8682	81.10	Q V			
9+ 5	46.4300	81.57	Q V			
9+10	46.9952	82.06	Q V			
9+15	47.5638	82.56	Q V			
9+20	48.1359	83.07	Q V			
9+25	48.7115	83.58	Q V			
9+30	49.2908	84.11	Q V			
9+35	49.8737	84.64	Q V			
9+40	50.4603	85.18	Q V			
9+45	51.0508	85.74	Q V			
9+50	51.6452	86.30	Q V			
9+55	52.2435	86.88	Q V			
10+ 0	52.8459	87.46	Q V			
10+ 5	53.4524	88.06	Q V			
10+10	54.0631	88.67	Q V			
10+15	54.6780	89.29	Q V			
10+20	55.2974	89.93	Q V			
10+25	55.9212	90.58	Q V			
10+30	56.5496	91.24	Q V			
10+35	57.1826	91.91	Q V			
10+40	57.8204	92.61	Q V			


10+45 58.4630 93.31
10+50 59.1106 94.03
10+55 59.7633 94.77
11+ 0 60.4212 95.53
11+ 5 61.0844 96.30
11+10 61.7531 97.09
11+15 62.4273 97.90
11+20 63.1073 98.73
11+25 63.7931 99.58
11+30 64.4849 100.45
11+35 65.1828 101.34
11+40 65.8871 102.26
11+45 66.5979 103.20
11+50 67.3153 104.17
11+55 68.0396 105.16
12+ 0 68.7709 106.19
12+ 5 69.5086 107.11
12+10 70.2514 107.86
12+15 70.9966 108.20
12+20 71.7416 108.17
12+25 72.4850 107.94
12+30 73.2249 107.43
12+35 73.9604 106.80
12+40 74.6952 106.69
12+45 75.4328 107.09
12+50 76.1747 107.73
12+55 76.9236 108.73
13+ 0 77.6803 109.88
13+ 5 78.4461 111.19
13+10 79.2219 112.65
13+15 80.0087 114.24
13+20 80.8070 115.92
13+25 81.6174 117.66
13+30 82.4403 119.49
13+35 83.2764 121.40
13+40 84.1263 123.40
13+45 84.9908 125.53
13+50 85.8708 127.77
13+55 86.7669 130.11
14+ 0 87.6800 132.59
14+ 5 88.6120 135.32
14+10 89.5655 138.45
14+15 90.5447 142.18
14+20 91.5540 146.56
14+25 92.5966 151.37
14+30 93.6762 156.77
14+35 94.7958 162.55
14+40 95.9536 168.11
14+45 97.1481 173.45
14+50 98.3805 178.94
14+55 99.6508 184.45
15+ 0 100.9615 190.31
15+ 5 102.3151 196.54
15+10 103.7151 203.28
15+15 105.1656 210.62
15+20 106.6723 218.77
15+25 108.2393 227.53
15+30 109.8704 236.83
15+35 111.5672 246.37
15+40 113.3341 256.55
15+45 115.1842 268.64
15+50 117.1360 283.40
15+55 119.2426 305.88
16+ 0 121.6303 346.70
16+ 5 124.7724 456.24
16+10 129.0803 625.50
16+15 135.0701 869.72
16+20 142.6310 1097.84
16+25 151.1434 1235.99
16+30 160.5271 1362.52
16+35 169.9000 1360.94

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16+40     177.4702   1099.19  |          |          |        V |Q         |
16+45     183.2392    837.65  |          |          |  Q     V |          |
16+50     188.0271    695.21  |          |        Q|          V|          |
16+55     191.5928    517.74  |          |   Q      |           V          |
17+ 0     194.6169    439.10  |          | Q        |           V          |
17+ 5     197.0621    355.04  |          Q          |           |V         |
17+10     199.0953    295.22  |        Q |          |           |V         |
17+15     200.7635    242.22  |      Q   |          |           |V         |
17+20     202.2828    220.60  |      Q   |          |           | V        |
17+25     203.7074    206.85  |    Q     |          |           | V        |
17+30     205.0476    194.59  |    Q     |          |           | V        |
17+35     206.3022    182.16  |    Q     |          |           | V        |
17+40     207.4690    169.42  |   Q      |          |           | V        |
17+45     208.4741    145.95  |   Q      |          |           | V        |
17+50     209.4263    138.25  |  Q       |          |           |  V       |
17+55     210.3370    132.24  |  Q       |          |           |  V       |
18+ 0     211.2119    127.03  |  Q       |          |           |  V       |
18+ 5     212.0555    122.50  |  Q       |          |           |  V       |
18+10     212.8730    118.70  |  Q       |          |           |  V       |
18+15     213.6704    115.77  |  Q       |          |           |  V       |
18+20     214.4526    113.57  |  Q       |          |           |  V       |
18+25     215.2229    111.86  |  Q       |          |           |   V      |
18+30     215.9852    110.69  |  Q       |          |           |   V      |
18+35     216.7418    109.85  |  Q       |          |           |   V      |
18+40     217.4905    108.71  |  Q       |          |           |   V      |
18+45     218.2294    107.29  |  Q       |          |           |   V      |
18+50     218.9581    105.82  |  Q       |          |           |   V      |
18+55     219.6754    104.14  | Q        |          |           |   V      |
19+ 0     220.3813    102.50  | Q        |          |           |   V      |
19+ 5     221.0758    100.84  | Q        |          |           |   V      |
19+10     221.7590     99.20  | Q        |          |           |    V     |
19+15     222.4309     97.56  | Q        |          |           |    V     |
19+20     223.0920     96.00  | Q        |          |           |    V     |
19+25     223.7429     94.51  | Q        |          |           |    V     |
19+30     224.3839     93.08  | Q        |          |           |    V     |
19+35     225.0156     91.72  | Q        |          |           |    V     |
19+40     225.6384     90.42  | Q        |          |           |    V     |
19+45     226.2523     89.14  | Q        |          |           |    V     |
19+50     226.8577     87.91  | Q        |          |           |    V     |
19+55     227.4549     86.72  | Q        |          |           |    V     |
20+ 0     228.0444     85.58  | Q        |          |           |     V    |
20+ 5     228.6262     84.49  | Q        |          |           |     V    |
20+10     229.2008     83.43  | Q        |          |           |     V    |
20+15     229.7684     82.41  | Q        |          |           |     V    |
20+20     230.3292     81.43  | Q        |          |           |     V    |
20+25     230.8835     80.48  | Q        |          |           |     V    |
20+30     231.4314     79.56  | Q        |          |           |     V    |
20+35     231.9732     78.67  | Q        |          |           |     V    |
20+40     232.5091     77.81  | Q        |          |           |     V    |
20+45     233.0392     76.97  | Q        |          |           |     V    |
20+50     233.5637     76.16  | Q        |          |           |     V    |
20+55     234.0829     75.38  | Q        |          |           |      V   |
21+ 0     234.5968     74.62  | Q        |          |           |      V   |
21+ 5     235.1055     73.88  | Q        |          |           |      V   |
21+10     235.6094     73.16  | Q        |          |           |      V   |
21+15     236.1084     72.46  | Q        |          |           |      V   |
21+20     236.6027     71.78  | Q        |          |           |      V   |
21+25     237.0925     71.11  | Q        |          |           |      V   |
21+30     237.5778     70.47  | Q        |          |           |      V   |
21+35     238.0588     69.84  |Q         |          |           |      V   |
21+40     238.5356     69.23  |Q         |          |           |      V   |
21+45     239.0083     68.63  |Q         |          |           |      V   |
21+50     239.4769     68.05  |Q         |          |           |      V   |
21+55     239.9417     67.48  |Q         |          |           |      V   |
22+ 0     240.4026     66.92  |Q         |          |           |       V  |
22+ 5     240.8598     66.38  |Q         |          |           |       V  |
22+10     241.3133     65.85  |Q         |          |           |       V  |
22+15     241.7633     65.34  |Q         |          |           |       V  |
22+20     242.2097     64.83  |Q         |          |           |       V  |
22+25     242.6528     64.33  |Q         |          |           |       V  |
22+30     243.0926     63.85  |Q         |          |           |       V  |
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  22+35     243.5290     63.38  |Q        |         |         |       V |
  22+40     243.9623     62.91  |Q        |         |         |       V |
  22+45     244.3925     62.46  |Q        |         |         |       V |
  22+50     244.8196     62.01  |Q        |         |         |       V |
  22+55     245.2436     61.58  |Q        |         |         |       V |
  23+ 0     245.6648     61.15  |Q        |         |         |       V |
  23+ 5     246.0830     60.73  |Q        |         |         |       V |
  23+10     246.4985     60.32  |Q        |         |         |        V|
  23+15     246.9111     59.92  |Q        |         |         |        V|
  23+20     247.3211     59.52  |Q        |         |         |        V|
  23+25     247.7284     59.14  |Q        |         |         |        V|
  23+30     248.1330     58.76  |Q        |         |         |        V|
  23+35     248.5351     58.38  |Q        |         |         |        V|
  23+40     248.9346     58.02  |Q        |         |         |        V|
  23+45     249.3317     57.66  |Q        |         |         |        V|
  23+50     249.7264     57.30  |Q        |         |         |        V|
  23+55     250.1186     56.95  |Q        |         |         |        V|
  24+ 0     250.5085     56.61  |Q        |         |         |        V|
  24+ 5     250.8922     55.72  |Q        |         |         |        V|
  24+10     251.2628     53.80  |Q        |         |         |        V|
  24+15     251.6070     49.98  |Q        |         |         |        V|
  24+20     251.9117     44.24  |Q        |         |         |        V|
  24+25     252.1699     37.49  |Q        |         |         |        V|
  24+30     252.3718     29.31  Q         |         |         |        V|
  24+35     252.5131     20.51  Q         |         |         |        V|
  24+40     252.6091     13.94  Q         |         |         |        V|
  24+45     252.6753      9.61  Q         |         |         |        V|
  24+50     252.7177      6.15  Q         |         |         |        V|
  24+55     252.7466      4.21  Q         |         |         |        V|
  25+ 0     252.7651      2.68  Q         |         |         |        V|
  25+ 5     252.7769      1.72  Q         |         |         |        V|
  25+10     252.7845      1.11  Q         |         |         |        V|
  25+15     252.7906      0.88  Q         |         |         |        V|
  25+20     252.7954      0.70  Q         |         |         |        V|
  25+25     252.7990      0.52  Q         |         |         |        V|
  25+30     252.8013      0.34  Q         |         |         |        V|
  25+35     252.8025      0.17  Q         |         |         |        V|
-------------------------------------------------------------------------
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APPENDIX B.2: UNIT HYDROGRAPH METHOD ANALYSIS, NODE 109

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

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

Study date 04/20/20

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

Program License Serial Number 6269

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR UNIT HYDROGRAPH METHOD
FN:ARA109UH24.UBM

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
1118.60	1	1.35
Rainfall data for year 100		
1118.60	6	2.84
Rainfall data for year 100		
1118.60	24	5.42

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.8	32.8	1118.60	1.000	0.973	0.473	0.460

Area-averaged adjusted loss rate Fm (In/Hr) = 0.460

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
529.10	0.473	32.8	32.8	20.49	0.015
589.50	0.527	98.0	98.0	0.20	0.956

Area-averaged catchment yield fraction, Y = 0.511
Area-averaged low loss fraction, Yb = 0.489
User entry of time of concentration = 0.768 (hours)

++

Watershed area = 1118.60(Ac.)
Catchment Lag time = 0.614 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 13.5634
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.460(In/Hr)
Average low loss rate fraction (Yb) = 0.489 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.500(In)
Computed peak 30-minute rainfall = 1.023(In)
Specified peak 1-hour rainfall = 1.350(In)
Computed peak 3-hour rainfall = 2.130(In)
Specified peak 6-hour rainfall = 2.840(In)
Specified peak 24-hour rainfall = 5.420(In)

Rainfall depth area reduction factors:
Using a total area of 1118.60(Ac.) (Ref: fig. E-4)

5-minute factor = 0.948 Adjusted rainfall = 0.473(In)
30-minute factor = 0.948 Adjusted rainfall = 0.969(In)
1-hour factor = 0.948 Adjusted rainfall = 1.279(In)
3-hour factor = 0.993 Adjusted rainfall = 2.116(In)
6-hour factor = 0.997 Adjusted rainfall = 2.830(In)
24-hour factor = 0.999 Adjusted rainfall = 5.412(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 = 13528.07 (CFS))	
1	0.775	104.785
2	2.645	252.966
3	5.965	449.201
4	12.051	823.305
5	19.861	1056.511
6	28.764	1204.469
7	39.018	1387.193
8	51.023	1623.959
9	63.342	1666.562
10	73.035	1311.293
11	79.008	807.970
12	85.222	840.684
13	89.170	534.077
14	91.894	368.566
15	94.266	320.851
16	95.957	228.681
17	97.110	156.101
18	97.958	114.623
19	98.317	48.540
20	98.561	33.031
21	98.805	33.031
22	99.049	33.030
23	99.293	33.012
24	99.537	33.027
25	99.781	33.029
26	100.000	29.572

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4734	0.4734
2	0.6247	0.1513
3	0.7347	0.1100
4	0.8243	0.0896
5	0.9013	0.0770
6	0.9695	0.0682
7	1.0311	0.0617
8	1.0877	0.0566

9	1.1402	0.0525
10	1.1892	0.0491
11	1.2355	0.0462
12	1.2792	0.0438
13	1.3270	0.0478
14	1.3728	0.0458
15	1.4169	0.0441
16	1.4594	0.0425
17	1.5005	0.0411
18	1.5403	0.0398
19	1.5789	0.0386
20	1.6164	0.0375
21	1.6530	0.0365
22	1.6886	0.0356
23	1.7233	0.0347
24	1.7572	0.0339
25	1.7904	0.0332
26	1.8228	0.0325
27	1.8546	0.0318
28	1.8858	0.0312
29	1.9163	0.0306
30	1.9463	0.0300
31	1.9758	0.0295
32	2.0047	0.0289
33	2.0331	0.0285
34	2.0611	0.0280
35	2.0887	0.0275
36	2.1158	0.0271
37	2.1403	0.0245
38	2.1644	0.0241
39	2.1881	0.0237
40	2.2115	0.0234
41	2.2345	0.0230
42	2.2572	0.0227
43	2.2796	0.0224
44	2.3017	0.0221
45	2.3235	0.0218
46	2.3450	0.0215
47	2.3663	0.0213
48	2.3873	0.0210
49	2.4080	0.0207
50	2.4285	0.0205
51	2.4488	0.0203
52	2.4688	0.0200
53	2.4886	0.0198
54	2.5082	0.0196
55	2.5276	0.0194
56	2.5468	0.0192
57	2.5658	0.0190
58	2.5846	0.0188
59	2.6032	0.0186
60	2.6216	0.0184
61	2.6399	0.0182
62	2.6579	0.0181
63	2.6759	0.0179
64	2.6936	0.0177
65	2.7112	0.0176
66	2.7286	0.0174
67	2.7459	0.0173
68	2.7630	0.0171
69	2.7800	0.0170
70	2.7968	0.0168
71	2.8135	0.0167
72	2.8301	0.0166
73	2.8484	0.0183
74	2.8666	0.0182
75	2.8846	0.0181
76	2.9026	0.0179
77	2.9204	0.0178
78	2.9380	0.0177
79	2.9556	0.0176

80	2.9730	0.0174
81	2.9904	0.0173
82	3.0076	0.0172
83	3.0247	0.0171
84	3.0417	0.0170
85	3.0585	0.0169
86	3.0753	0.0168
87	3.0920	0.0167
88	3.1086	0.0166
89	3.1250	0.0165
90	3.1414	0.0164
91	3.1577	0.0163
92	3.1739	0.0162
93	3.1900	0.0161
94	3.2060	0.0160
95	3.2219	0.0159
96	3.2377	0.0158
97	3.2534	0.0157
98	3.2691	0.0156
99	3.2846	0.0156
100	3.3001	0.0155
101	3.3155	0.0154
102	3.3308	0.0153
103	3.3460	0.0152
104	3.3612	0.0152
105	3.3763	0.0151
106	3.3913	0.0150
107	3.4062	0.0149
108	3.4210	0.0149
109	3.4358	0.0148
110	3.4505	0.0147
111	3.4652	0.0146
112	3.4797	0.0146
113	3.4942	0.0145
114	3.5087	0.0144
115	3.5230	0.0144
116	3.5373	0.0143
117	3.5515	0.0142
118	3.5657	0.0142
119	3.5798	0.0141
120	3.5939	0.0140
121	3.6078	0.0140
122	3.6217	0.0139
123	3.6356	0.0139
124	3.6494	0.0138
125	3.6631	0.0137
126	3.6768	0.0137
127	3.6904	0.0136
128	3.7040	0.0136
129	3.7175	0.0135
130	3.7309	0.0135
131	3.7443	0.0134
132	3.7577	0.0133
133	3.7710	0.0133
134	3.7842	0.0132
135	3.7974	0.0132
136	3.8105	0.0131
137	3.8236	0.0131
138	3.8366	0.0130
139	3.8496	0.0130
140	3.8625	0.0129
141	3.8754	0.0129
142	3.8882	0.0128
143	3.9010	0.0128
144	3.9138	0.0127
145	3.9265	0.0127
146	3.9391	0.0126
147	3.9517	0.0126
148	3.9642	0.0126
149	3.9767	0.0125
150	3.9892	0.0125

151	4.0016	0.0124
152	4.0140	0.0124
153	4.0263	0.0123
154	4.0386	0.0123
155	4.0509	0.0122
156	4.0631	0.0122
157	4.0752	0.0122
158	4.0873	0.0121
159	4.0994	0.0121
160	4.1115	0.0120
161	4.1235	0.0120
162	4.1354	0.0120
163	4.1473	0.0119
164	4.1592	0.0119
165	4.1711	0.0118
166	4.1829	0.0118
167	4.1946	0.0118
168	4.2064	0.0117
169	4.2181	0.0117
170	4.2297	0.0117
171	4.2413	0.0116
172	4.2529	0.0116
173	4.2645	0.0115
174	4.2760	0.0115
175	4.2874	0.0115
176	4.2989	0.0114
177	4.3103	0.0114
178	4.3217	0.0114
179	4.3330	0.0113
180	4.3443	0.0113
181	4.3556	0.0113
182	4.3668	0.0112
183	4.3780	0.0112
184	4.3892	0.0112
185	4.4003	0.0111
186	4.4115	0.0111
187	4.4225	0.0111
188	4.4336	0.0110
189	4.4446	0.0110
190	4.4556	0.0110
191	4.4665	0.0110
192	4.4774	0.0109
193	4.4883	0.0109
194	4.4992	0.0109
195	4.5100	0.0108
196	4.5208	0.0108
197	4.5316	0.0108
198	4.5424	0.0107
199	4.5531	0.0107
200	4.5638	0.0107
201	4.5744	0.0107
202	4.5850	0.0106
203	4.5957	0.0106
204	4.6062	0.0106
205	4.6168	0.0105
206	4.6273	0.0105
207	4.6378	0.0105
208	4.6482	0.0105
209	4.6587	0.0104
210	4.6691	0.0104
211	4.6795	0.0104
212	4.6898	0.0104
213	4.7002	0.0103
214	4.7105	0.0103
215	4.7208	0.0103
216	4.7310	0.0103
217	4.7413	0.0102
218	4.7515	0.0102
219	4.7616	0.0102
220	4.7718	0.0102
221	4.7819	0.0101

222	4.7920	0.0101
223	4.8021	0.0101
224	4.8122	0.0101
225	4.8222	0.0100
226	4.8322	0.0100
227	4.8422	0.0100
228	4.8522	0.0100
229	4.8621	0.0099
230	4.8721	0.0099
231	4.8820	0.0099
232	4.8918	0.0099
233	4.9017	0.0099
234	4.9115	0.0098
235	4.9213	0.0098
236	4.9311	0.0098
237	4.9409	0.0098
238	4.9506	0.0097
239	4.9603	0.0097
240	4.9700	0.0097
241	4.9797	0.0097
242	4.9893	0.0097
243	4.9990	0.0096
244	5.0086	0.0096
245	5.0182	0.0096
246	5.0277	0.0096
247	5.0373	0.0095
248	5.0468	0.0095
249	5.0563	0.0095
250	5.0658	0.0095
251	5.0753	0.0095
252	5.0847	0.0094
253	5.0942	0.0094
254	5.1036	0.0094
255	5.1130	0.0094
256	5.1223	0.0094
257	5.1317	0.0093
258	5.1410	0.0093
259	5.1503	0.0093
260	5.1596	0.0093
261	5.1689	0.0093
262	5.1781	0.0093
263	5.1874	0.0092
264	5.1966	0.0092
265	5.2058	0.0092
266	5.2150	0.0092
267	5.2241	0.0092
268	5.2333	0.0091
269	5.2424	0.0091
270	5.2515	0.0091
271	5.2606	0.0091
272	5.2696	0.0091
273	5.2787	0.0091
274	5.2877	0.0090
275	5.2967	0.0090
276	5.3057	0.0090
277	5.3147	0.0090
278	5.3237	0.0090
279	5.3326	0.0089
280	5.3416	0.0089
281	5.3505	0.0089
282	5.3594	0.0089
283	5.3683	0.0089
284	5.3771	0.0089
285	5.3860	0.0088
286	5.3948	0.0088
287	5.4036	0.0088
288	5.4124	0.0088

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)

1	0.0088	0.0043	0.0045
2	0.0088	0.0043	0.0045
3	0.0088	0.0043	0.0045
4	0.0089	0.0043	0.0045
5	0.0089	0.0044	0.0045
6	0.0089	0.0044	0.0046
7	0.0089	0.0044	0.0046
8	0.0090	0.0044	0.0046
9	0.0090	0.0044	0.0046
10	0.0090	0.0044	0.0046
11	0.0091	0.0044	0.0046
12	0.0091	0.0044	0.0046
13	0.0091	0.0045	0.0047
14	0.0091	0.0045	0.0047
15	0.0092	0.0045	0.0047
16	0.0092	0.0045	0.0047
17	0.0092	0.0045	0.0047
18	0.0092	0.0045	0.0047
19	0.0093	0.0045	0.0047
20	0.0093	0.0045	0.0047
21	0.0093	0.0046	0.0048
22	0.0093	0.0046	0.0048
23	0.0094	0.0046	0.0048
24	0.0094	0.0046	0.0048
25	0.0094	0.0046	0.0048
26	0.0095	0.0046	0.0048
27	0.0095	0.0047	0.0049
28	0.0095	0.0047	0.0049
29	0.0096	0.0047	0.0049
30	0.0096	0.0047	0.0049
31	0.0096	0.0047	0.0049
32	0.0097	0.0047	0.0049
33	0.0097	0.0047	0.0050
34	0.0097	0.0048	0.0050
35	0.0098	0.0048	0.0050
36	0.0098	0.0048	0.0050
37	0.0098	0.0048	0.0050
38	0.0099	0.0048	0.0050
39	0.0099	0.0048	0.0051
40	0.0099	0.0049	0.0051
41	0.0100	0.0049	0.0051
42	0.0100	0.0049	0.0051
43	0.0100	0.0049	0.0051
44	0.0101	0.0049	0.0051
45	0.0101	0.0049	0.0052
46	0.0101	0.0050	0.0052
47	0.0102	0.0050	0.0052
48	0.0102	0.0050	0.0052
49	0.0103	0.0050	0.0052
50	0.0103	0.0050	0.0053
51	0.0103	0.0051	0.0053
52	0.0104	0.0051	0.0053
53	0.0104	0.0051	0.0053
54	0.0104	0.0051	0.0053
55	0.0105	0.0051	0.0054
56	0.0105	0.0051	0.0054
57	0.0106	0.0052	0.0054
58	0.0106	0.0052	0.0054
59	0.0107	0.0052	0.0054
60	0.0107	0.0052	0.0055
61	0.0107	0.0053	0.0055
62	0.0108	0.0053	0.0055
63	0.0108	0.0053	0.0055
64	0.0109	0.0053	0.0055
65	0.0109	0.0053	0.0056
66	0.0110	0.0054	0.0056
67	0.0110	0.0054	0.0056
68	0.0110	0.0054	0.0056
69	0.0111	0.0054	0.0057
70	0.0111	0.0054	0.0057

71	0.0112	0.0055	0.0057
72	0.0112	0.0055	0.0057
73	0.0113	0.0055	0.0058
74	0.0113	0.0055	0.0058
75	0.0114	0.0056	0.0058
76	0.0114	0.0056	0.0058
77	0.0115	0.0056	0.0059
78	0.0115	0.0056	0.0059
79	0.0116	0.0057	0.0059
80	0.0117	0.0057	0.0060
81	0.0117	0.0057	0.0060
82	0.0118	0.0058	0.0060
83	0.0118	0.0058	0.0061
84	0.0119	0.0058	0.0061
85	0.0120	0.0058	0.0061
86	0.0120	0.0059	0.0061
87	0.0121	0.0059	0.0062
88	0.0121	0.0059	0.0062
89	0.0122	0.0060	0.0062
90	0.0122	0.0060	0.0063
91	0.0123	0.0060	0.0063
92	0.0124	0.0061	0.0063
93	0.0125	0.0061	0.0064
94	0.0125	0.0061	0.0064
95	0.0126	0.0062	0.0064
96	0.0126	0.0062	0.0065
97	0.0127	0.0062	0.0065
98	0.0128	0.0063	0.0065
99	0.0129	0.0063	0.0066
100	0.0129	0.0063	0.0066
101	0.0130	0.0064	0.0067
102	0.0131	0.0064	0.0067
103	0.0132	0.0064	0.0067
104	0.0132	0.0065	0.0068
105	0.0133	0.0065	0.0068
106	0.0134	0.0066	0.0068
107	0.0135	0.0066	0.0069
108	0.0136	0.0066	0.0069
109	0.0137	0.0067	0.0070
110	0.0137	0.0067	0.0070
111	0.0139	0.0068	0.0071
112	0.0139	0.0068	0.0071
113	0.0140	0.0069	0.0072
114	0.0141	0.0069	0.0072
115	0.0142	0.0070	0.0073
116	0.0143	0.0070	0.0073
117	0.0144	0.0071	0.0074
118	0.0145	0.0071	0.0074
119	0.0146	0.0072	0.0075
120	0.0147	0.0072	0.0075
121	0.0149	0.0073	0.0076
122	0.0149	0.0073	0.0076
123	0.0151	0.0074	0.0077
124	0.0152	0.0074	0.0077
125	0.0153	0.0075	0.0078
126	0.0154	0.0075	0.0079
127	0.0156	0.0076	0.0079
128	0.0156	0.0077	0.0080
129	0.0158	0.0077	0.0081
130	0.0159	0.0078	0.0081
131	0.0161	0.0079	0.0082
132	0.0162	0.0079	0.0083
133	0.0164	0.0080	0.0084
134	0.0165	0.0081	0.0084
135	0.0167	0.0082	0.0085
136	0.0168	0.0082	0.0086
137	0.0170	0.0083	0.0087
138	0.0171	0.0084	0.0087
139	0.0173	0.0085	0.0089
140	0.0174	0.0085	0.0089
141	0.0177	0.0086	0.0090

142	0.0178	0.0087	0.0091
143	0.0181	0.0088	0.0092
144	0.0182	0.0089	0.0093
145	0.0166	0.0081	0.0085
146	0.0167	0.0082	0.0085
147	0.0170	0.0083	0.0087
148	0.0171	0.0084	0.0087
149	0.0174	0.0085	0.0089
150	0.0176	0.0086	0.0090
151	0.0179	0.0088	0.0091
152	0.0181	0.0088	0.0092
153	0.0184	0.0090	0.0094
154	0.0186	0.0091	0.0095
155	0.0190	0.0093	0.0097
156	0.0192	0.0094	0.0098
157	0.0196	0.0096	0.0100
158	0.0198	0.0097	0.0101
159	0.0203	0.0099	0.0104
160	0.0205	0.0100	0.0105
161	0.0210	0.0103	0.0107
162	0.0213	0.0104	0.0109
163	0.0218	0.0107	0.0111
164	0.0221	0.0108	0.0113
165	0.0227	0.0111	0.0116
166	0.0230	0.0113	0.0118
167	0.0237	0.0116	0.0121
168	0.0241	0.0118	0.0123
169	0.0271	0.0133	0.0139
170	0.0275	0.0135	0.0141
171	0.0285	0.0139	0.0145
172	0.0289	0.0142	0.0148
173	0.0300	0.0147	0.0153
174	0.0306	0.0149	0.0156
175	0.0318	0.0155	0.0162
176	0.0325	0.0159	0.0166
177	0.0339	0.0166	0.0173
178	0.0347	0.0170	0.0177
179	0.0365	0.0179	0.0187
180	0.0375	0.0184	0.0192
181	0.0398	0.0195	0.0203
182	0.0411	0.0201	0.0210
183	0.0441	0.0216	0.0225
184	0.0458	0.0224	0.0234
185	0.0438	0.0214	0.0224
186	0.0462	0.0226	0.0236
187	0.0525	0.0257	0.0268
188	0.0566	0.0277	0.0289
189	0.0682	0.0333	0.0348
190	0.0770	0.0376	0.0393
191	0.1100	0.0384	0.0716
192	0.1513	0.0384	0.1129
193	0.4734	0.0384	0.4351
194	0.0896	0.0384	0.0512
195	0.0617	0.0302	0.0315
196	0.0491	0.0240	0.0251
197	0.0478	0.0234	0.0244
198	0.0425	0.0208	0.0217
199	0.0386	0.0189	0.0197
200	0.0356	0.0174	0.0182
201	0.0332	0.0162	0.0169
202	0.0312	0.0152	0.0159
203	0.0295	0.0144	0.0150
204	0.0280	0.0137	0.0143
205	0.0245	0.0120	0.0125
206	0.0234	0.0114	0.0119
207	0.0224	0.0110	0.0114
208	0.0215	0.0105	0.0110
209	0.0207	0.0101	0.0106
210	0.0200	0.0098	0.0102
211	0.0194	0.0095	0.0099
212	0.0188	0.0092	0.0096

213	0.0182	0.0089	0.0093
214	0.0177	0.0087	0.0091
215	0.0173	0.0084	0.0088
216	0.0168	0.0082	0.0086
217	0.0183	0.0090	0.0094
218	0.0179	0.0088	0.0092
219	0.0176	0.0086	0.0090
220	0.0172	0.0084	0.0088
221	0.0169	0.0083	0.0086
222	0.0166	0.0081	0.0085
223	0.0163	0.0080	0.0083
224	0.0160	0.0078	0.0082
225	0.0157	0.0077	0.0080
226	0.0155	0.0076	0.0079
227	0.0152	0.0075	0.0078
228	0.0150	0.0073	0.0077
229	0.0148	0.0072	0.0076
230	0.0146	0.0071	0.0074
231	0.0144	0.0070	0.0073
232	0.0142	0.0069	0.0072
233	0.0140	0.0068	0.0071
234	0.0138	0.0067	0.0070
235	0.0136	0.0067	0.0070
236	0.0135	0.0066	0.0069
237	0.0133	0.0065	0.0068
238	0.0131	0.0064	0.0067
239	0.0130	0.0063	0.0066
240	0.0128	0.0063	0.0066
241	0.0127	0.0062	0.0065
242	0.0126	0.0061	0.0064
243	0.0124	0.0061	0.0063
244	0.0123	0.0060	0.0063
245	0.0122	0.0059	0.0062
246	0.0120	0.0059	0.0062
247	0.0119	0.0058	0.0061
248	0.0118	0.0058	0.0060
249	0.0117	0.0057	0.0060
250	0.0116	0.0057	0.0059
251	0.0115	0.0056	0.0059
252	0.0114	0.0056	0.0058
253	0.0113	0.0055	0.0058
254	0.0112	0.0055	0.0057
255	0.0111	0.0054	0.0057
256	0.0110	0.0054	0.0056
257	0.0109	0.0053	0.0056
258	0.0108	0.0053	0.0055
259	0.0107	0.0052	0.0055
260	0.0106	0.0052	0.0054
261	0.0105	0.0052	0.0054
262	0.0105	0.0051	0.0053
263	0.0104	0.0051	0.0053
264	0.0103	0.0050	0.0053
265	0.0102	0.0050	0.0052
266	0.0102	0.0050	0.0052
267	0.0101	0.0049	0.0052
268	0.0100	0.0049	0.0051
269	0.0099	0.0049	0.0051
270	0.0099	0.0048	0.0050
271	0.0098	0.0048	0.0050
272	0.0097	0.0048	0.0050
273	0.0097	0.0047	0.0049
274	0.0096	0.0047	0.0049
275	0.0095	0.0047	0.0049
276	0.0095	0.0046	0.0048
277	0.0094	0.0046	0.0048
278	0.0094	0.0046	0.0048
279	0.0093	0.0046	0.0048
280	0.0093	0.0045	0.0047
281	0.0092	0.0045	0.0047
282	0.0091	0.0045	0.0047
283	0.0091	0.0044	0.0046

284	0.0090	0.0044	0.0046
285	0.0090	0.0044	0.0046
286	0.0089	0.0044	0.0046
287	0.0089	0.0043	0.0045
288	0.0088	0.0043	0.0045

Total soil rain loss = 2.40(In)
Total effective rainfall = 3.02(In)
Peak flow rate in flood hydrograph = 1271.39(CFS)

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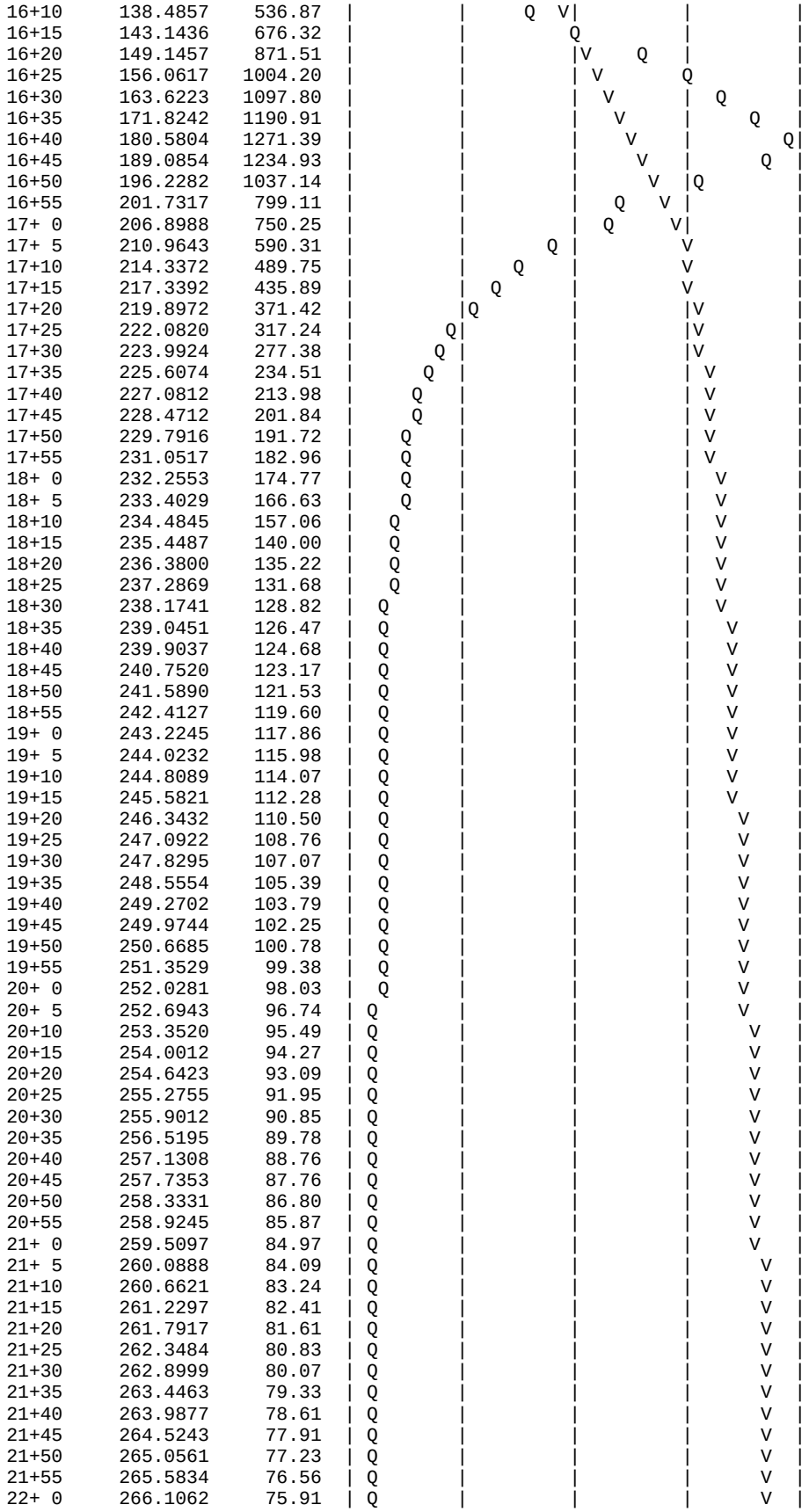
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	325.0	650.0	975.0	1300.0
0+ 5	0.0032	0.47	Q				
0+10	0.0143	1.61	Q				
0+15	0.0393	3.63	Q				
0+20	0.0899	7.34	Q				
0+25	0.1733	12.11	Q				
0+30	0.2942	17.55	Q				
0+35	0.4584	23.84	Q				
0+40	0.6732	31.20	Q				
0+45	0.9403	38.78	VQ				
0+50	1.2487	44.78	VQ				
0+55	1.5829	48.53	VQ				
1+ 0	1.9441	52.45	VQ				
1+ 5	2.3229	55.00	VQ				
1+10	2.7142	56.81	VQ				
1+15	3.1165	58.41	VQ				
1+20	3.5270	59.61	VQ				
1+25	3.9436	60.49	VQ				
1+30	4.3649	61.18	VQ				
1+35	4.7890	61.57	VQ				
1+40	5.2153	61.91	VQ				
1+45	5.6439	62.24	VQ				
1+50	6.0749	62.57	VQ				
1+55	6.5081	62.91	VQ				
2+ 0	6.9437	63.24	VQ				
2+ 5	7.3816	63.58	|Q				
2+10	7.8218	63.91	|Q				
2+15	8.2633	64.11	|Q				
2+20	8.7061	64.30	|Q				
2+25	9.1504	64.50	|Q				
2+30	9.5960	64.71	|Q				
2+35	10.0430	64.91	|Q				
2+40	10.4914	65.11	|VQ				
2+45	10.9413	65.32	|VQ				
2+50	11.3926	65.53	|VQ				
2+55	11.8453	65.74	|VQ				
3+ 0	12.2995	65.95	|VQ				
3+ 5	12.7552	66.16	|VQ				
3+10	13.2124	66.38	|VQ				
3+15	13.6711	66.60	|VQ				
3+20	14.1313	66.82	| Q				
3+25	14.5930	67.04	| Q				
3+30	15.0563	67.27	| Q				
3+35	15.5211	67.49	| Q				
3+40	15.9875	67.73	| Q				
3+45	16.4555	67.96	| Q				
3+50	16.9252	68.19	| Q				
3+55	17.3964	68.42	| Q				
4+ 0	17.8693	68.66	| Q				
4+ 5	18.3439	68.90	| Q				
4+10	18.8201	69.15	| Q				
4+15	19.2980	69.39	| Q				

4+20	19.7777	69.64	Q			
4+25	20.2590	69.89	Q			
4+30	20.7421	70.15	Q			
4+35	21.2270	70.40	QV			
4+40	21.7137	70.66	QV			
4+45	22.2021	70.92	QV			
4+50	22.6924	71.19	QV			
4+55	23.1845	71.46	QV			
5+ 0	23.6785	71.73	QV			
5+ 5	24.1744	72.00	QV			
5+10	24.6721	72.28	QV			
5+15	25.1718	72.55	QV			
5+20	25.6735	72.84	QV			
5+25	26.1771	73.12	QV			
5+30	26.6827	73.41	QV			
5+35	27.1903	73.70	QV			
5+40	27.6999	74.00	QV			
5+45	28.2116	74.30	Q V			
5+50	28.7254	74.60	Q V			
5+55	29.2413	74.91	Q V			
6+ 0	29.7594	75.22	Q V			
6+ 5	30.2796	75.53	Q V			
6+10	30.8020	75.85	Q V			
6+15	31.3265	76.17	Q V			
6+20	31.8534	76.50	Q V			
6+25	32.3825	76.82	Q V			
6+30	32.9139	77.16	Q V			
6+35	33.4476	77.50	Q V			
6+40	33.9837	77.84	Q V			
6+45	34.5221	78.18	Q V			
6+50	35.0630	78.54	Q V			
6+55	35.6063	78.89	Q V			
7+ 0	36.1521	79.25	Q V			
7+ 5	36.7004	79.61	Q V			
7+10	37.2513	79.99	Q V			
7+15	37.8047	80.36	Q V			
7+20	38.3608	80.74	Q V			
7+25	38.9195	81.12	Q V			
7+30	39.4809	81.52	Q V			
7+35	40.0450	81.91	Q V			
7+40	40.6119	82.31	Q V			
7+45	41.1815	82.72	Q V			
7+50	41.7541	83.13	Q V			
7+55	42.3295	83.55	Q V			
8+ 0	42.9078	83.98	Q V			
8+ 5	43.4891	84.40	Q V			
8+10	44.0734	84.84	Q V			
8+15	44.6608	85.29	Q V			
8+20	45.2513	85.74	Q V			
8+25	45.8450	86.20	Q V			
8+30	46.4418	86.66	Q V			
8+35	47.0419	87.13	Q V			
8+40	47.6453	87.62	Q V			
8+45	48.2521	88.10	Q V			
8+50	48.8623	88.60	Q V			
8+55	49.4759	89.10	Q V			
9+ 0	50.0931	89.62	Q V			
9+ 5	50.7138	90.13	Q V			
9+10	51.3383	90.67	Q V			
9+15	51.9664	91.20	Q V			
9+20	52.5983	91.75	Q V			
9+25	53.2340	92.31	Q V			
9+30	53.8736	92.88	Q V			
9+35	54.5172	93.45	Q V			
9+40	55.1649	94.04	Q V			
9+45	55.8167	94.64	Q V			
9+50	56.4727	95.25	Q V			
9+55	57.1329	95.87	Q V			
10+ 0	57.7976	96.51	Q V			
10+ 5	58.4667	97.15	Q V			
10+10	59.1403	97.81	Q V			

10+15	59.8185	98.48	Q V				
10+20	60.5015	99.17	Q V				
10+25	61.1892	99.86	Q V				
10+30	61.8819	100.58	Q V				
10+35	62.5796	101.30	Q V				
10+40	63.2824	102.05	Q V				
10+45	63.9904	102.80	Q V				
10+50	64.7038	103.58	Q V				
10+55	65.4226	104.37	Q V				
11+ 0	66.1470	105.19	Q V				
11+ 5	66.8771	106.01	Q V				
11+10	67.6131	106.87	Q V				
11+15	68.3550	107.73	Q V				
11+20	69.1031	108.62	Q V				
11+25	69.8574	109.53	Q V				
11+30	70.6182	110.47	Q V				
11+35	71.3856	111.42	Q V				
11+40	72.1597	112.40	Q V				
11+45	72.9407	113.40	Q V				
11+50	73.7288	114.44	Q V				
11+55	74.5242	115.49	Q V				
12+ 0	75.3272	116.59	Q V				
12+ 5	76.1371	117.60	Q V				
12+10	76.9533	118.51	Q V				
12+15	77.7746	119.25	Q V				
12+20	78.5989	119.68	Q V				
12+25	79.4247	119.91	Q V				
12+30	80.2514	120.04	Q V				
12+35	81.0780	120.01	Q V				
12+40	81.9032	119.82	Q V				
12+45	82.7269	119.61	Q V				
12+50	83.5519	119.80	Q V				
12+55	84.3819	120.51	Q V				
13+ 0	85.2169	121.25	Q V				
13+ 5	86.0594	122.33	Q V				
13+10	86.9110	123.65	Q V				
13+15	87.7722	125.05	Q V				
13+20	88.6443	126.63	Q V				
13+25	89.5282	128.34	Q V				
13+30	90.4248	130.18	Q V				
13+35	91.3349	132.15	Q V				
13+40	92.2594	134.24	Q V				
13+45	93.1988	136.41	Q V				
13+50	94.1541	138.70	Q V				
13+55	95.1257	141.08	Q V				
14+ 0	96.1148	143.61	Q V				
14+ 5	97.1227	146.36	Q V				
14+10	98.1520	149.46	Q V				
14+15	99.2053	152.93	Q V				
14+20	100.2869	157.05	Q V				
14+25	101.3998	161.59	Q V				
14+30	102.5468	166.55	Q V				
14+35	103.7308	171.92	Q V				
14+40	104.9558	177.86	Q V				
14+45	106.2236	184.10	Q V				
14+50	107.5342	190.30	Q V				
14+55	108.8856	196.23	Q V				
15+ 0	110.2814	202.66	Q V				
15+ 5	111.7218	209.15	Q V				
15+10	113.2098	216.05	Q V				
15+15	114.7487	223.45	Q V				
15+20	116.3434	231.55	Q V				
15+25	117.9965	240.03	Q V				
15+30	119.7123	249.14	Q V				
15+35	121.4944	258.76	Q V				
15+40	123.3464	268.91	Q V				
15+45	125.2774	280.39	Q V				
15+50	127.3056	294.48	Q V				
15+55	129.4699	314.27	Q V				
16+ 0	131.8523	345.92	Q V				
16+ 5	134.7883	426.30	Q V				



16+10	138.4857	536.87	
16+15	143.1436	676.32	
16+20	149.1457	871.51	
16+25	156.0617	1004.20	
16+30	163.6223	1097.80	
16+35	171.8242	1190.91	
16+40	180.5804	1271.39	
16+45	189.0854	1234.93	
16+50	196.2282	1037.14	
16+55	201.7317	799.11	
17+ 0	206.8988	750.25	
17+ 5	210.9643	590.31	
17+10	214.3372	489.75	
17+15	217.3392	435.89	
17+20	219.8972	371.42	
17+25	222.0820	317.24	
17+30	223.9924	277.38	
17+35	225.6074	234.51	
17+40	227.0812	213.98	
17+45	228.4712	201.84	
17+50	229.7916	191.72	
17+55	231.0517	182.96	
18+ 0	232.2553	174.77	
18+ 5	233.4029	166.63	
18+10	234.4845	157.06	
18+15	235.4487	140.00	
18+20	236.3800	135.22	
18+25	237.2869	131.68	
18+30	238.1741	128.82	
18+35	239.0451	126.47	
18+40	239.9037	124.68	
18+45	240.7520	123.17	
18+50	241.5890	121.53	
18+55	242.4127	119.60	
19+ 0	243.2245	117.86	
19+ 5	244.0232	115.98	
19+10	244.8089	114.07	
19+15	245.5821	112.28	
19+20	246.3432	110.50	
19+25	247.0922	108.76	
19+30	247.8295	107.07	
19+35	248.5554	105.39	
19+40	249.2702	103.79	
19+45	249.9744	102.25	
19+50	250.6685	100.78	
19+55	251.3529	99.38	
20+ 0	252.0281	98.03	
20+ 5	252.6943	96.74	
20+10	253.3520	95.49	
20+15	254.0012	94.27	
20+20	254.6423	93.09	
20+25	255.2755	91.95	
20+30	255.9012	90.85	
20+35	256.5195	89.78	
20+40	257.1308	88.76	
20+45	257.7353	87.76	
20+50	258.3331	86.80	
20+55	258.9245	85.87	
21+ 0	259.5097	84.97	
21+ 5	260.0888	84.09	
21+10	260.6621	83.24	
21+15	261.2297	82.41	
21+20	261.7917	81.61	
21+25	262.3484	80.83	
21+30	262.8999	80.07	
21+35	263.4463	79.33	
21+40	263.9877	78.61	
21+45	264.5243	77.91	
21+50	265.0561	77.23	
21+55	265.5834	76.56	
22+ 0	266.1062	75.91	

```
  22+ 5     266.6247     75.28  | Q       |         |         |      V  |
  22+10     267.1389     74.66  | Q       |         |         |       V |
  22+15     267.6489     74.06  | Q       |         |         |       V |
  22+20     268.1549     73.46  | Q       |         |         |       V |
  22+25     268.6568     72.89  | Q       |         |         |       V |
  22+30     269.1549     72.32  | Q       |         |         |       V |
  22+35     269.6492     71.77  | Q       |         |         |       V |
  22+40     270.1398     71.23  | Q       |         |         |       V |
  22+45     270.6267     70.70  | Q       |         |         |       V |
  22+50     271.1101     70.19  | Q       |         |         |       V |
  22+55     271.5900     69.68  | Q       |         |         |       V |
  23+ 0     272.0665     69.18  | Q       |         |         |       V |
  23+ 5     272.5396     68.70  | Q       |         |         |       V |
  23+10     273.0095     68.22  | Q       |         |         |       V |
  23+15     273.4761     67.76  | Q       |         |         |       V |
  23+20     273.9396     67.30  | Q       |         |         |        V|
  23+25     274.4000     66.85  | Q       |         |         |        V|
  23+30     274.8573     66.41  | Q       |         |         |        V|
  23+35     275.3117     65.98  | Q       |         |         |        V|
  23+40     275.7632     65.55  | Q       |         |         |        V|
  23+45     276.2118     65.14  | Q       |         |         |        V|
  23+50     276.6575     64.73  |Q        |         |         |        V|
  23+55     277.1006     64.33  |Q        |         |         |        V|
  24+ 0     277.5409     63.93  |Q        |         |         |        V|
  24+ 5     277.9753     63.07  |Q        |         |         |        V|
  24+10     278.3992     61.56  |Q        |         |         |        V|
  24+15     278.8068     59.18  |Q        |         |         |        V|
  24+20     279.1866     55.14  |Q        |         |         |        V|
  24+25     279.5314     50.08  |Q        |         |         |        V|
  24+30     279.8371     44.38  |Q        |         |         |        V|
  24+35     280.0981     37.90  |Q        |         |         |        V|
  24+40     280.3075     30.40  Q         |         |         |        V|
  24+45     280.4641     22.75  Q         |         |         |        V|
  24+50     280.5794     16.73  Q         |         |         |        V|
  24+55     280.6690     13.01  Q         |         |         |        V|
  25+ 0     280.7321      9.16  Q         |         |         |        V|
  25+ 5     280.7783      6.72  Q         |         |         |        V|
  25+10     280.8129      5.02  Q         |         |         |        V|
  25+15     280.8374      3.56  Q         |         |         |        V|
  25+20     280.8547      2.51  Q         |         |         |        V|
  25+25     280.8671      1.79  Q         |         |         |        V|
  25+30     280.8758      1.27  Q         |         |         |        V|
  25+35     280.8830      1.05  Q         |         |         |        V|
  25+40     280.8891      0.89  Q         |         |         |        V|
  25+45     280.8942      0.74  Q         |         |         |        V|
  25+50     280.8983      0.59  Q         |         |         |        V|
  25+55     280.9012      0.43  Q         |         |         |        V|
  26+ 0     280.9032      0.28  Q         |         |         |        V|
  26+ 5     280.9041      0.13  Q         |         |         |        V|
-------------------------------------------------------------------------
```

APPENDIX B.3: UNIT HYDROGRAPH METHOD ANALYSIS, NODE 110

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

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

Study date 04/20/20

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

Program License Serial Number 6269

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR UNIT HYDROGRAPH METHOD
FN:ARA110UH24.UBM

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
1605.30	1	1.35
Rainfall data for year 100		
1605.30	6	2.84
Rainfall data for year 100		
1605.30	24	5.42

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.6	32.6	1605.30	1.000	0.974	0.412	0.401

Area-averaged adjusted loss rate Fm (In/Hr) = 0.401

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
661.38	0.412	32.6	32.6	20.67	0.014
943.92	0.588	98.0	98.0	0.20	0.956

Area-averaged catchment yield fraction, Y = 0.568
Area-averaged low loss fraction, Yb = 0.432
User entry of time of concentration = 0.916 (hours)

++

Watershed area = 1605.30(Ac.)
Catchment Lag time = 0.733 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 11.3744
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.401(In/Hr)
Average low loss rate fraction (Yb) = 0.432 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.500(In)
Computed peak 30-minute rainfall = 1.023(In)
Specified peak 1-hour rainfall = 1.350(In)
Computed peak 3-hour rainfall = 2.130(In)
Specified peak 6-hour rainfall = 2.840(In)
Specified peak 24-hour rainfall = 5.420(In)

Rainfall depth area reduction factors:
Using a total area of 1605.30(Ac.) (Ref: fig. E-4)

5-minute factor = 0.925 Adjusted rainfall = 0.462(In)
30-minute factor = 0.925 Adjusted rainfall = 0.946(In)
1-hour factor = 0.925 Adjusted rainfall = 1.248(In)
3-hour factor = 0.990 Adjusted rainfall = 2.110(In)
6-hour factor = 0.995 Adjusted rainfall = 2.826(In)
24-hour factor = 0.998 Adjusted rainfall = 5.409(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 = 19414.10 (CFS))	
1	0.641	124.371
2	2.122	287.683
3	4.299	422.508
4	8.252	767.491
5	14.057	1127.049
6	20.789	1306.873
7	28.284	1455.079
8	36.703	1634.543
9	46.571	1915.821
10	56.593	1945.622
11	66.887	1998.381
12	74.097	1399.900
13	78.894	931.282
14	84.101	1010.837
15	88.306	816.388
16	90.487	423.427
17	92.780	445.099
18	94.620	357.225
19	95.981	264.213
20	96.969	191.876
21	97.740	149.646
22	98.202	89.692
23	98.407	39.753
24	98.611	39.752
25	98.816	39.752
26	99.021	39.752
27	99.226	39.731
28	99.430	39.739
29	99.635	39.752
30	99.838	39.331
31	100.000	31.527

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4620	0.4620
2	0.6097	0.1476
3	0.7170	0.1074

4	0.8045	0.0874
5	0.8796	0.0751
6	0.9461	0.0665
7	1.0063	0.0602
8	1.0615	0.0552
9	1.1127	0.0512
10	1.1606	0.0479
11	1.2057	0.0451
12	1.2484	0.0427
13	1.2971	0.0486
14	1.3438	0.0467
15	1.3888	0.0450
16	1.4323	0.0435
17	1.4743	0.0421
18	1.5151	0.0408
19	1.5548	0.0396
20	1.5933	0.0386
21	1.6309	0.0376
22	1.6675	0.0366
23	1.7033	0.0358
24	1.7383	0.0350
25	1.7725	0.0342
26	1.8060	0.0335
27	1.8388	0.0328
28	1.8711	0.0322
29	1.9027	0.0316
30	1.9337	0.0311
31	1.9643	0.0305
32	1.9943	0.0300
33	2.0238	0.0295
34	2.0528	0.0291
35	2.0815	0.0286
36	2.1097	0.0282
37	2.1342	0.0245
38	2.1583	0.0241
39	2.1821	0.0238
40	2.2055	0.0234
41	2.2286	0.0231
42	2.2513	0.0228
43	2.2738	0.0224
44	2.2959	0.0221
45	2.3178	0.0219
46	2.3394	0.0216
47	2.3607	0.0213
48	2.3817	0.0210
49	2.4025	0.0208
50	2.4231	0.0206
51	2.4434	0.0203
52	2.4635	0.0201
53	2.4833	0.0199
54	2.5030	0.0196
55	2.5224	0.0194
56	2.5417	0.0192
57	2.5607	0.0190
58	2.5795	0.0188
59	2.5982	0.0187
60	2.6167	0.0185
61	2.6350	0.0183
62	2.6531	0.0181
63	2.6711	0.0180
64	2.6889	0.0178
65	2.7065	0.0176
66	2.7240	0.0175
67	2.7413	0.0173
68	2.7585	0.0172
69	2.7755	0.0170
70	2.7924	0.0169
71	2.8091	0.0168
72	2.8258	0.0166
73	2.8441	0.0183
74	2.8622	0.0182

75	2.8803	0.0181
76	2.8982	0.0179
77	2.9160	0.0178
78	2.9337	0.0177
79	2.9513	0.0176
80	2.9687	0.0174
81	2.9860	0.0173
82	3.0032	0.0172
83	3.0203	0.0171
84	3.0373	0.0170
85	3.0542	0.0169
86	3.0710	0.0168
87	3.0877	0.0167
88	3.1042	0.0166
89	3.1207	0.0165
90	3.1371	0.0164
91	3.1534	0.0163
92	3.1695	0.0162
93	3.1856	0.0161
94	3.2016	0.0160
95	3.2175	0.0159
96	3.2334	0.0158
97	3.2491	0.0157
98	3.2647	0.0156
99	3.2803	0.0156
100	3.2958	0.0155
101	3.3112	0.0154
102	3.3265	0.0153
103	3.3417	0.0152
104	3.3569	0.0152
105	3.3720	0.0151
106	3.3870	0.0150
107	3.4019	0.0149
108	3.4167	0.0149
109	3.4315	0.0148
110	3.4462	0.0147
111	3.4609	0.0146
112	3.4754	0.0146
113	3.4899	0.0145
114	3.5044	0.0144
115	3.5187	0.0144
116	3.5330	0.0143
117	3.5473	0.0142
118	3.5614	0.0142
119	3.5755	0.0141
120	3.5896	0.0140
121	3.6036	0.0140
122	3.6175	0.0139
123	3.6313	0.0139
124	3.6451	0.0138
125	3.6589	0.0137
126	3.6726	0.0137
127	3.6862	0.0136
128	3.6997	0.0136
129	3.7133	0.0135
130	3.7267	0.0135
131	3.7401	0.0134
132	3.7535	0.0133
133	3.7667	0.0133
134	3.7800	0.0132
135	3.7932	0.0132
136	3.8063	0.0131
137	3.8194	0.0131
138	3.8324	0.0130
139	3.8454	0.0130
140	3.8583	0.0129
141	3.8712	0.0129
142	3.8841	0.0128
143	3.8968	0.0128
144	3.9096	0.0127
145	3.9223	0.0127

146	3.9349	0.0126
147	3.9475	0.0126
148	3.9601	0.0126
149	3.9726	0.0125
150	3.9851	0.0125
151	3.9975	0.0124
152	4.0099	0.0124
153	4.0222	0.0123
154	4.0345	0.0123
155	4.0467	0.0122
156	4.0589	0.0122
157	4.0711	0.0122
158	4.0832	0.0121
159	4.0953	0.0121
160	4.1074	0.0120
161	4.1194	0.0120
162	4.1313	0.0120
163	4.1433	0.0119
164	4.1551	0.0119
165	4.1670	0.0118
166	4.1788	0.0118
167	4.1906	0.0118
168	4.2023	0.0117
169	4.2140	0.0117
170	4.2257	0.0117
171	4.2373	0.0116
172	4.2489	0.0116
173	4.2604	0.0116
174	4.2719	0.0115
175	4.2834	0.0115
176	4.2949	0.0114
177	4.3063	0.0114
178	4.3177	0.0114
179	4.3290	0.0113
180	4.3403	0.0113
181	4.3516	0.0113
182	4.3628	0.0112
183	4.3740	0.0112
184	4.3852	0.0112
185	4.3964	0.0111
186	4.4075	0.0111
187	4.4186	0.0111
188	4.4296	0.0111
189	4.4406	0.0110
190	4.4516	0.0110
191	4.4626	0.0110
192	4.4735	0.0109
193	4.4844	0.0109
194	4.4953	0.0109
195	4.5061	0.0108
196	4.5169	0.0108
197	4.5277	0.0108
198	4.5385	0.0108
199	4.5492	0.0107
200	4.5599	0.0107
201	4.5705	0.0107
202	4.5812	0.0106
203	4.5918	0.0106
204	4.6024	0.0106
205	4.6129	0.0106
206	4.6234	0.0105
207	4.6339	0.0105
208	4.6444	0.0105
209	4.6549	0.0104
210	4.6653	0.0104
211	4.6757	0.0104
212	4.6860	0.0104
213	4.6964	0.0103
214	4.7067	0.0103
215	4.7170	0.0103
216	4.7272	0.0103

217	4.7375	0.0102
218	4.7477	0.0102
219	4.7579	0.0102
220	4.7680	0.0102
221	4.7782	0.0101
222	4.7883	0.0101
223	4.7984	0.0101
224	4.8085	0.0101
225	4.8185	0.0100
226	4.8285	0.0100
227	4.8385	0.0100
228	4.8485	0.0100
229	4.8584	0.0099
230	4.8684	0.0099
231	4.8783	0.0099
232	4.8881	0.0099
233	4.8980	0.0099
234	4.9078	0.0098
235	4.9176	0.0098
236	4.9274	0.0098
237	4.9372	0.0098
238	4.9470	0.0097
239	4.9567	0.0097
240	4.9664	0.0097
241	4.9761	0.0097
242	4.9857	0.0097
243	4.9954	0.0096
244	5.0050	0.0096
245	5.0146	0.0096
246	5.0242	0.0096
247	5.0337	0.0096
248	5.0432	0.0095
249	5.0528	0.0095
250	5.0623	0.0095
251	5.0717	0.0095
252	5.0812	0.0095
253	5.0906	0.0094
254	5.1000	0.0094
255	5.1094	0.0094
256	5.1188	0.0094
257	5.1282	0.0094
258	5.1375	0.0093
259	5.1468	0.0093
260	5.1561	0.0093
261	5.1654	0.0093
262	5.1746	0.0093
263	5.1839	0.0092
264	5.1931	0.0092
265	5.2023	0.0092
266	5.2115	0.0092
267	5.2207	0.0092
268	5.2298	0.0091
269	5.2389	0.0091
270	5.2481	0.0091
271	5.2572	0.0091
272	5.2662	0.0091
273	5.2753	0.0091
274	5.2843	0.0090
275	5.2934	0.0090
276	5.3024	0.0090
277	5.3114	0.0090
278	5.3203	0.0090
279	5.3293	0.0090
280	5.3382	0.0089
281	5.3471	0.0089
282	5.3560	0.0089
283	5.3649	0.0089
284	5.3738	0.0089
285	5.3827	0.0089
286	5.3915	0.0088
287	5.4003	0.0088

288 5.4091 0.0088

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0088	0.0038	0.0050
2	0.0088	0.0038	0.0050
3	0.0089	0.0038	0.0050
4	0.0089	0.0038	0.0050
5	0.0089	0.0038	0.0051
6	0.0089	0.0039	0.0051
7	0.0090	0.0039	0.0051
8	0.0090	0.0039	0.0051
9	0.0090	0.0039	0.0051
10	0.0090	0.0039	0.0051
11	0.0091	0.0039	0.0051
12	0.0091	0.0039	0.0052
13	0.0091	0.0039	0.0052
14	0.0091	0.0039	0.0052
15	0.0092	0.0040	0.0052
16	0.0092	0.0040	0.0052
17	0.0092	0.0040	0.0052
18	0.0092	0.0040	0.0052
19	0.0093	0.0040	0.0053
20	0.0093	0.0040	0.0053
21	0.0093	0.0040	0.0053
22	0.0094	0.0040	0.0053
23	0.0094	0.0041	0.0053
24	0.0094	0.0041	0.0053
25	0.0095	0.0041	0.0054
26	0.0095	0.0041	0.0054
27	0.0095	0.0041	0.0054
28	0.0095	0.0041	0.0054
29	0.0096	0.0041	0.0054
30	0.0096	0.0041	0.0055
31	0.0096	0.0042	0.0055
32	0.0097	0.0042	0.0055
33	0.0097	0.0042	0.0055
34	0.0097	0.0042	0.0055
35	0.0098	0.0042	0.0055
36	0.0098	0.0042	0.0056
37	0.0098	0.0042	0.0056
38	0.0099	0.0043	0.0056
39	0.0099	0.0043	0.0056
40	0.0099	0.0043	0.0056
41	0.0100	0.0043	0.0057
42	0.0100	0.0043	0.0057
43	0.0100	0.0043	0.0057
44	0.0101	0.0043	0.0057
45	0.0101	0.0044	0.0057
46	0.0101	0.0044	0.0058
47	0.0102	0.0044	0.0058
48	0.0102	0.0044	0.0058
49	0.0103	0.0044	0.0058
50	0.0103	0.0044	0.0058
51	0.0103	0.0045	0.0059
52	0.0104	0.0045	0.0059
53	0.0104	0.0045	0.0059
54	0.0104	0.0045	0.0059
55	0.0105	0.0045	0.0060
56	0.0105	0.0045	0.0060
57	0.0106	0.0046	0.0060
58	0.0106	0.0046	0.0060
59	0.0107	0.0046	0.0061
60	0.0107	0.0046	0.0061
61	0.0108	0.0046	0.0061
62	0.0108	0.0047	0.0061
63	0.0108	0.0047	0.0062
64	0.0109	0.0047	0.0062
65	0.0109	0.0047	0.0062

66	0.0110	0.0047	0.0062
67	0.0110	0.0048	0.0063
68	0.0111	0.0048	0.0063
69	0.0111	0.0048	0.0063
70	0.0111	0.0048	0.0063
71	0.0112	0.0048	0.0064
72	0.0112	0.0049	0.0064
73	0.0113	0.0049	0.0064
74	0.0113	0.0049	0.0064
75	0.0114	0.0049	0.0065
76	0.0114	0.0049	0.0065
77	0.0115	0.0050	0.0065
78	0.0116	0.0050	0.0066
79	0.0116	0.0050	0.0066
80	0.0117	0.0050	0.0066
81	0.0117	0.0051	0.0067
82	0.0118	0.0051	0.0067
83	0.0118	0.0051	0.0067
84	0.0119	0.0051	0.0068
85	0.0120	0.0052	0.0068
86	0.0120	0.0052	0.0068
87	0.0121	0.0052	0.0069
88	0.0121	0.0052	0.0069
89	0.0122	0.0053	0.0069
90	0.0122	0.0053	0.0070
91	0.0123	0.0053	0.0070
92	0.0124	0.0053	0.0070
93	0.0125	0.0054	0.0071
94	0.0125	0.0054	0.0071
95	0.0126	0.0054	0.0072
96	0.0126	0.0055	0.0072
97	0.0127	0.0055	0.0072
98	0.0128	0.0055	0.0073
99	0.0129	0.0056	0.0073
100	0.0129	0.0056	0.0073
101	0.0130	0.0056	0.0074
102	0.0131	0.0057	0.0074
103	0.0132	0.0057	0.0075
104	0.0132	0.0057	0.0075
105	0.0133	0.0058	0.0076
106	0.0134	0.0058	0.0076
107	0.0135	0.0058	0.0077
108	0.0136	0.0059	0.0077
109	0.0137	0.0059	0.0078
110	0.0137	0.0059	0.0078
111	0.0139	0.0060	0.0079
112	0.0139	0.0060	0.0079
113	0.0140	0.0061	0.0080
114	0.0141	0.0061	0.0080
115	0.0142	0.0061	0.0081
116	0.0143	0.0062	0.0081
117	0.0144	0.0062	0.0082
118	0.0145	0.0063	0.0082
119	0.0146	0.0063	0.0083
120	0.0147	0.0064	0.0084
121	0.0149	0.0064	0.0084
122	0.0149	0.0064	0.0085
123	0.0151	0.0065	0.0086
124	0.0152	0.0065	0.0086
125	0.0153	0.0066	0.0087
126	0.0154	0.0067	0.0087
127	0.0156	0.0067	0.0088
128	0.0156	0.0068	0.0089
129	0.0158	0.0068	0.0090
130	0.0159	0.0069	0.0090
131	0.0161	0.0070	0.0091
132	0.0162	0.0070	0.0092
133	0.0164	0.0071	0.0093
134	0.0165	0.0071	0.0094
135	0.0167	0.0072	0.0095
136	0.0168	0.0072	0.0095

137	0.0170	0.0073	0.0096
138	0.0171	0.0074	0.0097
139	0.0173	0.0075	0.0098
140	0.0174	0.0075	0.0099
141	0.0177	0.0076	0.0100
142	0.0178	0.0077	0.0101
143	0.0181	0.0078	0.0103
144	0.0182	0.0079	0.0103
145	0.0166	0.0072	0.0094
146	0.0168	0.0072	0.0095
147	0.0170	0.0074	0.0097
148	0.0172	0.0074	0.0098
149	0.0175	0.0076	0.0099
150	0.0176	0.0076	0.0100
151	0.0180	0.0078	0.0102
152	0.0181	0.0078	0.0103
153	0.0185	0.0080	0.0105
154	0.0187	0.0081	0.0106
155	0.0190	0.0082	0.0108
156	0.0192	0.0083	0.0109
157	0.0196	0.0085	0.0112
158	0.0199	0.0086	0.0113
159	0.0203	0.0088	0.0115
160	0.0206	0.0089	0.0117
161	0.0210	0.0091	0.0120
162	0.0213	0.0092	0.0121
163	0.0219	0.0094	0.0124
164	0.0221	0.0096	0.0126
165	0.0228	0.0098	0.0129
166	0.0231	0.0100	0.0131
167	0.0238	0.0103	0.0135
168	0.0241	0.0104	0.0137
169	0.0282	0.0122	0.0160
170	0.0286	0.0124	0.0163
171	0.0295	0.0128	0.0168
172	0.0300	0.0130	0.0170
173	0.0311	0.0134	0.0176
174	0.0316	0.0137	0.0180
175	0.0328	0.0142	0.0187
176	0.0335	0.0145	0.0190
177	0.0350	0.0151	0.0199
178	0.0358	0.0155	0.0203
179	0.0376	0.0162	0.0213
180	0.0386	0.0167	0.0219
181	0.0408	0.0176	0.0232
182	0.0421	0.0182	0.0239
183	0.0450	0.0194	0.0256
184	0.0467	0.0202	0.0265
185	0.0427	0.0184	0.0243
186	0.0451	0.0195	0.0256
187	0.0512	0.0221	0.0291
188	0.0552	0.0239	0.0314
189	0.0665	0.0287	0.0378
190	0.0751	0.0324	0.0427
191	0.1074	0.0335	0.0739
192	0.1476	0.0335	0.1142
193	0.4620	0.0335	0.4286
194	0.0874	0.0335	0.0540
195	0.0602	0.0260	0.0342
196	0.0479	0.0207	0.0272
197	0.0486	0.0210	0.0276
198	0.0435	0.0188	0.0247
199	0.0396	0.0171	0.0225
200	0.0366	0.0158	0.0208
201	0.0342	0.0148	0.0194
202	0.0322	0.0139	0.0183
203	0.0305	0.0132	0.0173
204	0.0291	0.0126	0.0165
205	0.0245	0.0106	0.0139
206	0.0234	0.0101	0.0133
207	0.0224	0.0097	0.0127

208	0.0216	0.0093	0.0123
209	0.0208	0.0090	0.0118
210	0.0201	0.0087	0.0114
211	0.0194	0.0084	0.0110
212	0.0188	0.0081	0.0107
213	0.0183	0.0079	0.0104
214	0.0178	0.0077	0.0101
215	0.0173	0.0075	0.0098
216	0.0169	0.0073	0.0096
217	0.0183	0.0079	0.0104
218	0.0179	0.0077	0.0102
219	0.0176	0.0076	0.0100
220	0.0172	0.0074	0.0098
221	0.0169	0.0073	0.0096
222	0.0166	0.0072	0.0094
223	0.0163	0.0070	0.0092
224	0.0160	0.0069	0.0091
225	0.0157	0.0068	0.0089
226	0.0155	0.0067	0.0088
227	0.0152	0.0066	0.0087
228	0.0150	0.0065	0.0085
229	0.0148	0.0064	0.0084
230	0.0146	0.0063	0.0083
231	0.0144	0.0062	0.0082
232	0.0142	0.0061	0.0080
233	0.0140	0.0060	0.0079
234	0.0138	0.0060	0.0078
235	0.0136	0.0059	0.0077
236	0.0135	0.0058	0.0076
237	0.0133	0.0057	0.0075
238	0.0131	0.0057	0.0075
239	0.0130	0.0056	0.0074
240	0.0128	0.0055	0.0073
241	0.0127	0.0055	0.0072
242	0.0126	0.0054	0.0071
243	0.0124	0.0054	0.0071
244	0.0123	0.0053	0.0070
245	0.0122	0.0053	0.0069
246	0.0120	0.0052	0.0068
247	0.0119	0.0052	0.0068
248	0.0118	0.0051	0.0067
249	0.0117	0.0051	0.0066
250	0.0116	0.0050	0.0066
251	0.0115	0.0050	0.0065
252	0.0114	0.0049	0.0065
253	0.0113	0.0049	0.0064
254	0.0112	0.0048	0.0063
255	0.0111	0.0048	0.0063
256	0.0110	0.0047	0.0062
257	0.0109	0.0047	0.0062
258	0.0108	0.0047	0.0061
259	0.0107	0.0046	0.0061
260	0.0106	0.0046	0.0060
261	0.0106	0.0046	0.0060
262	0.0105	0.0045	0.0059
263	0.0104	0.0045	0.0059
264	0.0103	0.0045	0.0059
265	0.0102	0.0044	0.0058
266	0.0102	0.0044	0.0058
267	0.0101	0.0044	0.0057
268	0.0100	0.0043	0.0057
269	0.0099	0.0043	0.0057
270	0.0099	0.0043	0.0056
271	0.0098	0.0042	0.0056
272	0.0097	0.0042	0.0055
273	0.0097	0.0042	0.0055
274	0.0096	0.0042	0.0055
275	0.0096	0.0041	0.0054
276	0.0095	0.0041	0.0054
277	0.0094	0.0041	0.0054
278	0.0094	0.0041	0.0053

279	0.0093	0.0040	0.0053
280	0.0093	0.0040	0.0053
281	0.0092	0.0040	0.0052
282	0.0091	0.0040	0.0052
283	0.0091	0.0039	0.0052
284	0.0090	0.0039	0.0051
285	0.0090	0.0039	0.0051
286	0.0089	0.0039	0.0051
287	0.0089	0.0038	0.0050
288	0.0088	0.0038	0.0050

Total soil rain loss = 2.12(In)
Total effective rainfall = 3.29(In)
Peak flow rate in flood hydrograph = 1637.28(CFS)

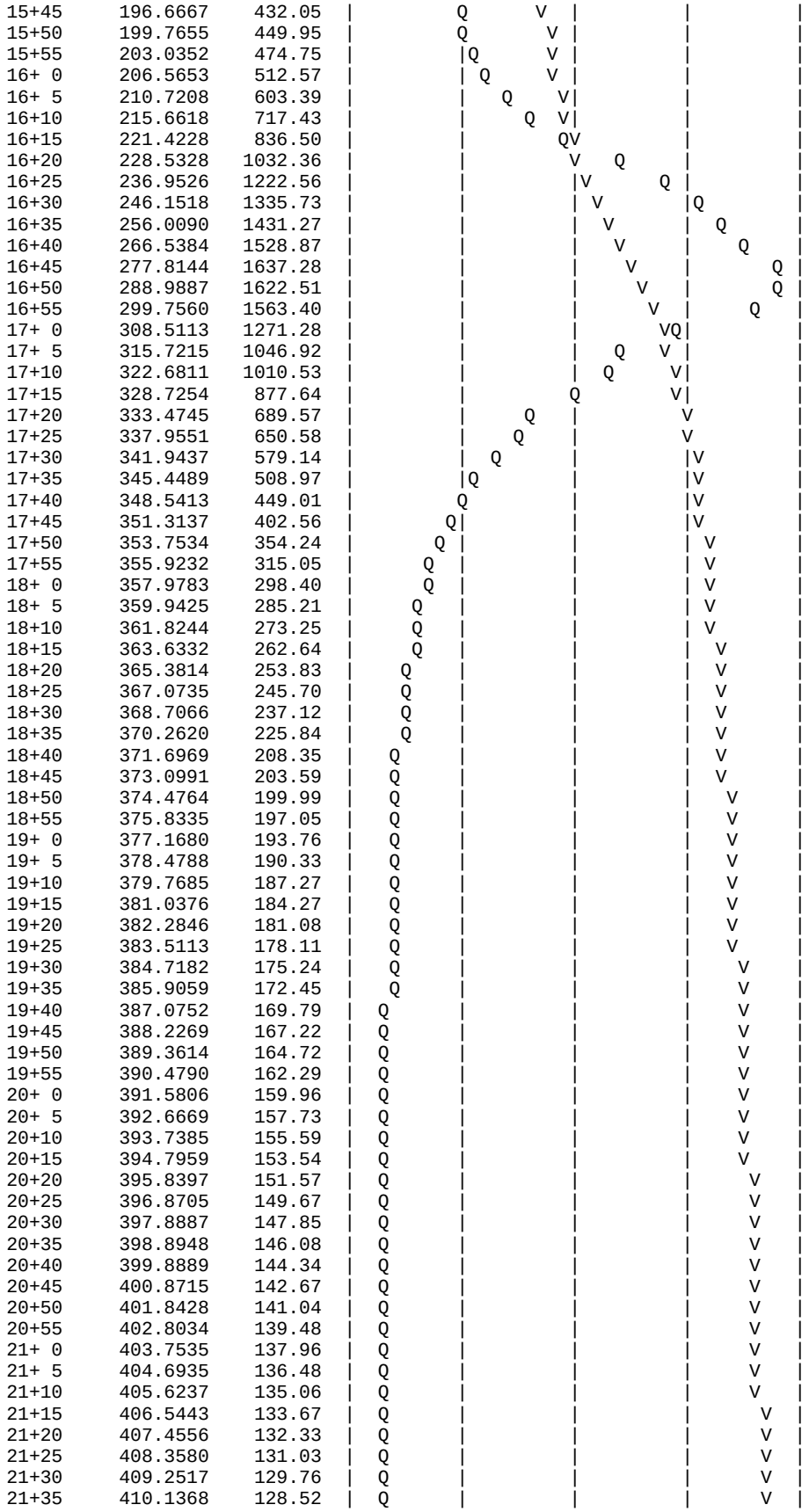
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 425.0 850.0 1275.0 1700.0
0+ 5	0.0043	0.62	Q
0+10	0.0185	2.06	Q
0+15	0.0473	4.18	Q
0+20	0.1026	8.03	Q
0+25	0.1968	13.68	Q
0+30	0.3363	20.26	Q
0+35	0.5263	27.59	Q
0+40	0.7731	35.83	Q
0+45	1.0865	45.51	VQ
0+50	1.4678	55.37	VQ
0+55	1.9190	65.51	VQ
1+ 0	2.4197	72.69	VQ
1+ 5	2.9538	77.55	VQ
1+10	3.5242	82.83	VQ
1+15	4.1244	87.15	V Q
1+20	4.7409	89.51	V Q
1+25	5.3745	92.00	V Q
1+30	6.0222	94.05	V Q
1+35	6.6809	95.64	V Q
1+40	7.3481	96.88	V Q
1+45	8.0224	97.91	V Q
1+50	8.7018	98.65	V Q
1+55	9.3846	99.14	V Q
2+ 0	10.0709	99.64	V Q
2+ 5	10.7605	100.14	V Q
2+10	11.4536	100.64	|VQ
2+15	12.1502	101.14	|VQ
2+20	12.8502	101.65	|VQ
2+25	13.5538	102.16	|VQ
2+30	14.2609	102.67	|VQ
2+35	14.9713	103.15	|VQ
2+40	15.6839	103.47	|VQ
2+45	16.3988	103.80	|VQ
2+50	17.1159	104.12	|VQ
2+55	17.8353	104.46	|VQ
3+ 0	18.5570	104.79	|VQ
3+ 5	19.2810	105.13	|VQ
3+10	20.0074	105.47	|VQ
3+15	20.7361	105.81	|VQ
3+20	21.4672	106.16	|VQ
3+25	22.2007	106.51	| Q
3+30	22.9367	106.86	| Q
3+35	23.6751	107.22	| Q
3+40	24.4160	107.58	| Q
3+45	25.1594	107.94	| Q
3+50	25.9054	108.31	| Q

3+55	26.6539	108.68	Q			
4+ 0	27.4050	109.06	Q			
4+ 5	28.1586	109.44	Q			
4+10	28.9150	109.82	Q			
4+15	29.6739	110.20	Q			
4+20	30.4356	110.59	Q			
4+25	31.2000	110.99	Q			
4+30	31.9671	111.39	Q			
4+35	32.7370	111.79	Q			
4+40	33.5097	112.19	QV			
4+45	34.2852	112.61	QV			
4+50	35.0636	113.02	QV			
4+55	35.8449	113.44	QV			
5+ 0	36.6291	113.87	QV			
5+ 5	37.4163	114.30	QV			
5+10	38.2064	114.73	QV			
5+15	38.9996	115.17	QV			
5+20	39.7958	115.61	QV			
5+25	40.5951	116.06	QV			
5+30	41.3975	116.51	QV			
5+35	42.2031	116.97	QV			
5+40	43.0119	117.43	QV			
5+45	43.8239	117.90	QV			
5+50	44.6391	118.38	Q V			
5+55	45.4577	118.86	Q V			
6+ 0	46.2796	119.34	Q V			
6+ 5	47.1049	119.84	Q V			
6+10	47.9337	120.33	Q V			
6+15	48.7659	120.84	Q V			
6+20	49.6016	121.34	Q V			
6+25	50.4408	121.86	Q V			
6+30	51.2837	122.38	Q V			
6+35	52.1302	122.91	Q V			
6+40	52.9803	123.44	Q V			
6+45	53.8342	123.99	Q V			
6+50	54.6919	124.54	Q V			
6+55	55.5534	125.09	Q V			
7+ 0	56.4188	125.65	Q V			
7+ 5	57.2882	126.23	Q V			
7+10	58.1615	126.80	Q V			
7+15	59.0388	127.39	Q V			
7+20	59.9202	127.98	Q V			
7+25	60.8058	128.59	Q V			
7+30	61.6956	129.19	Q V			
7+35	62.5896	129.81	Q V			
7+40	63.4880	130.44	Q V			
7+45	64.3907	131.08	Q V			
7+50	65.2979	131.72	Q V			
7+55	66.2095	132.38	Q V			
8+ 0	67.1258	133.04	Q V			
8+ 5	68.0467	133.71	Q V			
8+10	68.9722	134.39	Q V			
8+15	69.9026	135.09	Q V			
8+20	70.8378	135.79	Q V			
8+25	71.7780	136.51	Q V			
8+30	72.7231	137.23	Q V			
8+35	73.6733	137.97	Q V			
8+40	74.6286	138.72	Q V			
8+45	75.5892	139.48	Q V			
8+50	76.5551	140.25	Q V			
8+55	77.5264	141.04	Q V			
9+ 0	78.5032	141.83	Q V			
9+ 5	79.4856	142.64	Q V			
9+10	80.4736	143.46	Q V			
9+15	81.4675	144.31	Q V			
9+20	82.4672	145.15	Q V			
9+25	83.4729	146.03	Q V			
9+30	84.4846	146.90	Q V			
9+35	85.5025	147.81	Q V			
9+40	86.5267	148.72	Q V			
9+45	87.5574	149.65	Q V			

9+50	88.5945	150.59	Q V				
9+55	89.6383	151.56	Q V				
10+ 0	90.6889	152.54	Q V				
10+ 5	91.7464	153.55	Q V				
10+10	92.8109	154.56	Q V				
10+15	93.8825	155.61	Q V				
10+20	94.9615	156.66	Q V				
10+25	96.0479	157.75	Q V				
10+30	97.1419	158.85	Q V				
10+35	98.2438	159.98	Q V				
10+40	99.3535	161.13	Q V				
10+45	100.4713	162.31	Q V				
10+50	101.5973	163.50	Q V				
10+55	102.7318	164.73	Q V				
11+ 0	103.8750	165.98	Q V				
11+ 5	105.0269	167.27	Q V				
11+10	106.1879	168.57	Q V				
11+15	107.3581	169.92	Q V				
11+20	108.5377	171.28	Q V				
11+25	109.7271	172.69	Q V				
11+30	110.9263	174.12	Q V				
11+35	112.1356	175.60	Q V				
11+40	113.3554	177.10	Q V				
11+45	114.5858	178.66	Q V				
11+50	115.8271	180.24	Q V				
11+55	117.0797	181.87	Q V				
12+ 0	118.3437	183.54	Q V				
12+ 5	119.6188	185.13	Q V				
12+10	120.9038	186.59	Q V				
12+15	122.1984	187.97	Q V				
12+20	123.5002	189.03	Q V				
12+25	124.8073	189.78	Q V				
12+30	126.1184	190.38	Q V				
12+35	127.4332	190.90	Q V				
12+40	128.7505	191.28	Q V				
12+45	130.0690	191.44	Q V				
12+50	131.3887	191.62	Q V				
12+55	132.7099	191.84	Q V				
13+ 0	134.0372	192.73	Q V				
13+ 5	135.3748	194.21	Q V				
13+10	136.7224	195.68	Q V				
13+15	138.0823	197.46	Q V				
13+20	139.4578	199.72	Q V				
13+25	140.8497	202.10	Q V				
13+30	142.2591	204.65	Q V				
13+35	143.6878	207.45	Q V				
13+40	145.1370	210.42	Q V				
13+45	146.6081	213.61	Q V				
13+50	148.1024	216.97	Q V				
13+55	149.6216	220.59	Q V				
14+ 0	151.1667	224.34	Q V				
14+ 5	152.7407	228.55	Q V				
14+10	154.3470	233.23	Q V				
14+15	155.9891	238.43	Q V				
14+20	157.6728	244.48	Q V				
14+25	159.4049	251.51	Q V				
14+30	161.1895	259.13	Q V				
14+35	163.0312	267.41	Q V				
14+40	164.9346	276.38	Q V				
14+45	166.9066	286.33	Q V				
14+50	168.9502	296.73	Q V				
14+55	171.0700	307.80	Q V				
15+ 0	173.2619	318.26	Q V				
15+ 5	175.5247	328.56	Q V				
15+10	177.8641	339.67	Q V				
15+15	180.2837	351.33	Q V				
15+20	182.7848	363.16	Q V				
15+25	185.3724	375.71	Q V				
15+30	188.0489	388.63	Q V				
15+35	190.8212	402.54	Q V				
15+40	193.6911	416.71	Q V				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15+50 199.7655 449.95
15+55 203.0352 474.75
16+ 0 206.5653 512.57
16+ 5 210.7208 603.39
16+10 215.6618 717.43
16+15 221.4228 836.50
16+20 228.5328 1032.36
16+25 236.9526 1222.56
16+30 246.1518 1335.73
16+35 256.0090 1431.27
16+40 266.5384 1528.87
16+45 277.8144 1637.28
16+50 288.9887 1622.51
16+55 299.7560 1563.40
17+ 0 308.5113 1271.28
17+ 5 315.7215 1046.92
17+10 322.6811 1010.53
17+15 328.7254 877.64
17+20 333.4745 689.57
17+25 337.9551 650.58
17+30 341.9437 579.14
17+35 345.4489 508.97
17+40 348.5413 449.01
17+45 351.3137 402.56
17+50 353.7534 354.24
17+55 355.9232 315.05
18+ 0 357.9783 298.40
18+ 5 359.9425 285.21
18+10 361.8244 273.25
18+15 363.6332 262.64
18+20 365.3814 253.83
18+25 367.0735 245.70
18+30 368.7066 237.12
18+35 370.2620 225.84
18+40 371.6969 208.35
18+45 373.0991 203.59
18+50 374.4764 199.99
18+55 375.8335 197.05
19+ 0 377.1680 193.76
19+ 5 378.4788 190.33
19+10 379.7685 187.27
19+15 381.0376 184.27
19+20 382.2846 181.08
19+25 383.5113 178.11
19+30 384.7182 175.24
19+35 385.9059 172.45
19+40 387.0752 169.79
19+45 388.2269 167.22
19+50 389.3614 164.72
19+55 390.4790 162.29
20+ 0 391.5806 159.96
20+ 5 392.6669 157.73
20+10 393.7385 155.59
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20+25 396.8705 149.67
20+30 397.8887 147.85
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20+55 402.8034 139.48
21+ 0 403.7535 137.96
21+ 5 404.6935 136.48
21+10 405.6237 135.06
21+15 406.5443 133.67
21+20 407.4556 132.33
21+25 408.3580 131.03
21+30 409.2517 129.76
21+35 410.1368 128.52

```
   21+40     411.0137    127.32  | Q       |         |         |      V  |
   21+45     411.8825    126.16  | Q       |         |         |      V  |
   21+50     412.7436    125.02  | Q       |         |         |      V  |
   21+55     413.5969    123.91  | Q       |         |         |      V  |
   22+ 0     414.4429    122.83  | Q       |         |         |      V  |
   22+ 5     415.2816    121.78  | Q       |         |         |      V  |
   22+10     416.1132    120.75  | Q       |         |         |      V  |
   22+15     416.9379    119.75  | Q       |         |         |      V  |
   22+20     417.7559    118.77  | Q       |         |         |       V |
   22+25     418.5673    117.81  | Q       |         |         |       V |
   22+30     419.3723    116.88  | Q       |         |         |       V |
   22+35     420.1709    115.97  | Q       |         |         |       V |
   22+40     420.9635    115.08  | Q       |         |         |       V |
   22+45     421.7500    114.20  | Q       |         |         |       V |
   22+50     422.5306    113.35  | Q       |         |         |       V |
   22+55     423.3055    112.51  | Q       |         |         |       V |
   23+ 0     424.0748    111.70  | Q       |         |         |       V |
   23+ 5     424.8385    110.89  | Q       |         |         |       V |
   23+10     425.5968    110.11  | Q       |         |         |       V |
   23+15     426.3499    109.34  | Q       |         |         |       V |
   23+20     427.0977    108.59  | Q       |         |         |       V |
   23+25     427.8405    107.85  | Q       |         |         |       V |
   23+30     428.5783    107.12  | Q       |         |         |        V|
   23+35     429.3111    106.41  | Q       |         |         |        V|
   23+40     430.0392    105.72  | Q       |         |         |        V|
   23+45     430.7626    105.03  | Q       |         |         |        V|
   23+50     431.4813    104.36  | Q       |         |         |        V|
   23+55     432.1955    103.70  | Q       |         |         |        V|
   24+ 0     432.9053    103.06  | Q       |         |         |        V|
   24+ 5     433.6064    101.80  | Q       |         |         |        V|
   24+10     434.2933     99.74  | Q       |         |         |        V|
   24+15     434.9616     97.03  | Q       |         |         |        V|
   24+20     435.5995     92.62  | Q       |         |         |        V|
   24+25     436.1948     86.45  | Q       |         |         |        V|
   24+30     436.7418     79.41  |Q        |         |         |        V|
   24+35     437.2354     71.68  |Q        |         |         |        V|
   24+40     437.6701     63.11  |Q        |         |         |        V|
   24+45     438.0363     53.18  |Q        |         |         |        V|
   24+50     438.3336     43.16  |Q        |         |         |        V|
   24+55     438.5604     32.94  Q         |         |         |        V|
   25+ 0     438.7378     25.76  Q         |         |         |        V|
   25+ 5     438.8822     20.96  Q         |         |         |        V|
   25+10     438.9910     15.80  Q         |         |         |        V|
   25+15     439.0710     11.63  Q         |         |         |        V|
   25+20     439.1361      9.45  Q         |         |         |        V|
   25+25     439.1855      7.17  Q         |         |         |        V|
   25+30     439.2223      5.35  Q         |         |         |        V|
   25+35     439.2499      4.00  Q         |         |         |        V|
   25+40     439.2707      3.02  Q         |         |         |        V|
   25+45     439.2862      2.25  Q         |         |         |        V|
   25+50     439.2985      1.79  Q         |         |         |        V|
   25+55     439.3094      1.58  Q         |         |         |        V|
   26+ 0     439.3189      1.38  Q         |         |         |        V|
   26+ 5     439.3270      1.17  Q         |         |         |        V|
   26+10     439.3336      0.96  Q         |         |         |        V|
   26+15     439.3388      0.76  Q         |         |         |        V|
   26+20     439.3427      0.56  Q         |         |         |        V|
   26+25     439.3451      0.36  Q         |         |         |        V|
   26+30     439.3462      0.16  Q         |         |         |         V
-------------------------------------------------------------------------
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APPENDIX B.4: UNIT HYDROGRAPH METHOD ANALYSIS, NODE 111

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

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

Study date 04/20/20

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

Program License Serial Number 6269

IVDA 3RD & 6TH STREET SPECIFIC PLAN
100-YEAR UNIT HYDROGRAPH METHOD
FN:ARA111UH24.UBM

Storm Event Year = 100

Antecedent Moisture Condition = 2

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
1746.90	1	1.35
Rainfall data for year 100		
1746.90	6	2.84
Rainfall data for year 100		
1746.90	24	5.42

++

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

SCS curve No.(AMCII)	SCS curve NO.(AMC 2)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.8	32.8	1746.90	1.000	0.973	0.420	0.409

Area-averaged adjusted loss rate Fm (In/Hr) = 0.409

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC2)	S	Pervious Yield Fr
733.70	0.420	32.8	32.8	20.49	0.015
1013.20	0.580	98.0	98.0	0.20	0.956

Area-averaged catchment yield fraction, Y = 0.561
Area-averaged low loss fraction, Yb = 0.439
User entry of time of concentration = 1.060 (hours)

++

Watershed area = 1746.90(Ac.)
Catchment Lag time = 0.848 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 9.8252
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.409(In/Hr)
Average low loss rate fraction (Yb) = 0.439 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.500(In)
Computed peak 30-minute rainfall = 1.023(In)
Specified peak 1-hour rainfall = 1.350(In)
Computed peak 3-hour rainfall = 2.130(In)
Specified peak 6-hour rainfall = 2.840(In)
Specified peak 24-hour rainfall = 5.420(In)

Rainfall depth area reduction factors:
Using a total area of 1746.90(Ac.) (Ref: fig. E-4)

5-minute factor = 0.918 Adjusted rainfall = 0.459(In)
30-minute factor = 0.918 Adjusted rainfall = 0.939(In)
1-hour factor = 0.918 Adjusted rainfall = 1.239(In)
3-hour factor = 0.990 Adjusted rainfall = 2.108(In)
6-hour factor = 0.995 Adjusted rainfall = 2.824(In)
24-hour factor = 0.998 Adjusted rainfall = 5.408(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 = 21126.57 (CFS))	
1	0.547	115.539
2	1.777	259.850
3	3.374	337.323
4	6.102	576.491
5	10.331	893.415
6	15.666	1126.982
7	21.600	1253.642
8	28.101	1373.575
9	35.275	1515.657
10	43.448	1726.510
11	52.314	1873.074
12	61.335	1905.979
13	69.425	1709.033
14	74.925	1161.957
15	79.014	863.910
16	83.502	948.194
17	87.634	872.983
18	89.601	415.595
19	91.642	431.019
20	93.477	387.838
21	94.940	308.996
22	96.063	237.157
23	96.916	180.358
24	97.595	143.313
25	98.111	109.119
26	98.310	41.973
27	98.487	37.367
28	98.664	37.367
29	98.840	37.367
30	99.017	37.367
31	99.194	37.349
32	99.371	37.347
33	99.548	37.367
34	99.725	37.367
35	99.890	34.956
36	100.000	23.237

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4587	0.4587
2	0.6053	0.1466
3	0.7119	0.1066
4	0.7987	0.0868
5	0.8733	0.0746
6	0.9393	0.0661
7	0.9991	0.0597
8	1.0539	0.0548
9	1.1047	0.0508
10	1.1523	0.0476
11	1.1971	0.0448
12	1.2395	0.0424
13	1.2883	0.0489
14	1.3353	0.0470
15	1.3806	0.0453
16	1.4244	0.0437
17	1.4667	0.0424
18	1.5078	0.0411
19	1.5477	0.0399
20	1.5866	0.0389
21	1.6244	0.0379
22	1.6614	0.0369
23	1.6974	0.0361
24	1.7327	0.0353
25	1.7673	0.0345
26	1.8011	0.0338
27	1.8342	0.0332
28	1.8668	0.0325
29	1.8987	0.0319
30	1.9301	0.0314
31	1.9609	0.0308
32	1.9912	0.0303
33	2.0211	0.0298
34	2.0504	0.0294
35	2.0794	0.0289
36	2.1079	0.0285
37	2.1324	0.0245
38	2.1565	0.0241
39	2.1803	0.0238
40	2.2037	0.0234
41	2.2268	0.0231
42	2.2496	0.0228
43	2.2721	0.0225
44	2.2942	0.0222
45	2.3161	0.0219
46	2.3377	0.0216
47	2.3590	0.0213
48	2.3801	0.0211
49	2.4009	0.0208
50	2.4215	0.0206
51	2.4418	0.0203
52	2.4619	0.0201
53	2.4818	0.0199
54	2.5014	0.0197
55	2.5209	0.0195
56	2.5401	0.0193
57	2.5592	0.0191
58	2.5781	0.0189
59	2.5967	0.0187
60	2.6152	0.0185
61	2.6335	0.0183
62	2.6517	0.0181
63	2.6697	0.0180
64	2.6875	0.0178
65	2.7051	0.0177
66	2.7226	0.0175
67	2.7400	0.0173
68	2.7571	0.0172
69	2.7742	0.0170

70	2.7911	0.0169
71	2.8079	0.0168
72	2.8245	0.0166
73	2.8428	0.0183
74	2.8610	0.0182
75	2.8790	0.0181
76	2.8970	0.0179
77	2.9148	0.0178
78	2.9324	0.0177
79	2.9500	0.0176
80	2.9674	0.0174
81	2.9848	0.0173
82	3.0020	0.0172
83	3.0191	0.0171
84	3.0361	0.0170
85	3.0529	0.0169
86	3.0697	0.0168
87	3.0864	0.0167
88	3.1030	0.0166
89	3.1194	0.0165
90	3.1358	0.0164
91	3.1521	0.0163
92	3.1683	0.0162
93	3.1844	0.0161
94	3.2004	0.0160
95	3.2163	0.0159
96	3.2321	0.0158
97	3.2478	0.0157
98	3.2635	0.0156
99	3.2790	0.0156
100	3.2945	0.0155
101	3.3099	0.0154
102	3.3252	0.0153
103	3.3405	0.0152
104	3.3556	0.0152
105	3.3707	0.0151
106	3.3857	0.0150
107	3.4006	0.0149
108	3.4155	0.0149
109	3.4303	0.0148
110	3.4450	0.0147
111	3.4596	0.0146
112	3.4742	0.0146
113	3.4887	0.0145
114	3.5031	0.0144
115	3.5175	0.0144
116	3.5318	0.0143
117	3.5460	0.0142
118	3.5602	0.0142
119	3.5743	0.0141
120	3.5883	0.0140
121	3.6023	0.0140
122	3.6162	0.0139
123	3.6301	0.0139
124	3.6439	0.0138
125	3.6576	0.0137
126	3.6713	0.0137
127	3.6849	0.0136
128	3.6985	0.0136
129	3.7120	0.0135
130	3.7255	0.0135
131	3.7389	0.0134
132	3.7522	0.0133
133	3.7655	0.0133
134	3.7788	0.0132
135	3.7919	0.0132
136	3.8051	0.0131
137	3.8182	0.0131
138	3.8312	0.0130
139	3.8442	0.0130
140	3.8571	0.0129

141	3.8700	0.0129
142	3.8828	0.0128
143	3.8956	0.0128
144	3.9084	0.0127
145	3.9211	0.0127
146	3.9337	0.0126
147	3.9463	0.0126
148	3.9589	0.0126
149	3.9714	0.0125
150	3.9838	0.0125
151	3.9963	0.0124
152	4.0086	0.0124
153	4.0210	0.0123
154	4.0333	0.0123
155	4.0455	0.0123
156	4.0577	0.0122
157	4.0699	0.0122
158	4.0820	0.0121
159	4.0941	0.0121
160	4.1062	0.0120
161	4.1182	0.0120
162	4.1301	0.0120
163	4.1421	0.0119
164	4.1539	0.0119
165	4.1658	0.0118
166	4.1776	0.0118
167	4.1894	0.0118
168	4.2011	0.0117
169	4.2128	0.0117
170	4.2245	0.0117
171	4.2361	0.0116
172	4.2477	0.0116
173	4.2592	0.0116
174	4.2708	0.0115
175	4.2823	0.0115
176	4.2937	0.0114
177	4.3051	0.0114
178	4.3165	0.0114
179	4.3278	0.0113
180	4.3392	0.0113
181	4.3504	0.0113
182	4.3617	0.0112
183	4.3729	0.0112
184	4.3841	0.0112
185	4.3952	0.0111
186	4.4063	0.0111
187	4.4174	0.0111
188	4.4285	0.0111
189	4.4395	0.0110
190	4.4505	0.0110
191	4.4614	0.0110
192	4.4724	0.0109
193	4.4833	0.0109
194	4.4941	0.0109
195	4.5050	0.0108
196	4.5158	0.0108
197	4.5266	0.0108
198	4.5373	0.0108
199	4.5481	0.0107
200	4.5587	0.0107
201	4.5694	0.0107
202	4.5801	0.0106
203	4.5907	0.0106
204	4.6012	0.0106
205	4.6118	0.0106
206	4.6223	0.0105
207	4.6328	0.0105
208	4.6433	0.0105
209	4.6537	0.0104
210	4.6642	0.0104
211	4.6746	0.0104

212	4.6849	0.0104
213	4.6953	0.0103
214	4.7056	0.0103
215	4.7159	0.0103
216	4.7261	0.0103
217	4.7364	0.0102
218	4.7466	0.0102
219	4.7568	0.0102
220	4.7670	0.0102
221	4.7771	0.0101
222	4.7872	0.0101
223	4.7973	0.0101
224	4.8074	0.0101
225	4.8174	0.0100
226	4.8274	0.0100
227	4.8374	0.0100
228	4.8474	0.0100
229	4.8574	0.0100
230	4.8673	0.0099
231	4.8772	0.0099
232	4.8871	0.0099
233	4.8969	0.0099
234	4.9068	0.0098
235	4.9166	0.0098
236	4.9264	0.0098
237	4.9361	0.0098
238	4.9459	0.0097
239	4.9556	0.0097
240	4.9653	0.0097
241	4.9750	0.0097
242	4.9847	0.0097
243	4.9943	0.0096
244	5.0039	0.0096
245	5.0135	0.0096
246	5.0231	0.0096
247	5.0327	0.0096
248	5.0422	0.0095
249	5.0517	0.0095
250	5.0612	0.0095
251	5.0707	0.0095
252	5.0801	0.0095
253	5.0896	0.0094
254	5.0990	0.0094
255	5.1084	0.0094
256	5.1178	0.0094
257	5.1271	0.0094
258	5.1365	0.0093
259	5.1458	0.0093
260	5.1551	0.0093
261	5.1644	0.0093
262	5.1736	0.0093
263	5.1829	0.0092
264	5.1921	0.0092
265	5.2013	0.0092
266	5.2105	0.0092
267	5.2197	0.0092
268	5.2288	0.0092
269	5.2379	0.0091
270	5.2471	0.0091
271	5.2562	0.0091
272	5.2652	0.0091
273	5.2743	0.0091
274	5.2833	0.0090
275	5.2924	0.0090
276	5.3014	0.0090
277	5.3104	0.0090
278	5.3193	0.0090
279	5.3283	0.0090
280	5.3372	0.0089
281	5.3462	0.0089
282	5.3551	0.0089

283	5.3640	0.0089
284	5.3728	0.0089
285	5.3817	0.0089
286	5.3905	0.0088
287	5.3994	0.0088
288	5.4082	0.0088

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0088	0.0039	0.0049
2	0.0088	0.0039	0.0049
3	0.0089	0.0039	0.0050
4	0.0089	0.0039	0.0050
5	0.0089	0.0039	0.0050
6	0.0089	0.0039	0.0050
7	0.0090	0.0039	0.0050
8	0.0090	0.0039	0.0050
9	0.0090	0.0040	0.0051
10	0.0090	0.0040	0.0051
11	0.0091	0.0040	0.0051
12	0.0091	0.0040	0.0051
13	0.0091	0.0040	0.0051
14	0.0091	0.0040	0.0051
15	0.0092	0.0040	0.0051
16	0.0092	0.0040	0.0052
17	0.0092	0.0041	0.0052
18	0.0092	0.0041	0.0052
19	0.0093	0.0041	0.0052
20	0.0093	0.0041	0.0052
21	0.0093	0.0041	0.0052
22	0.0094	0.0041	0.0052
23	0.0094	0.0041	0.0053
24	0.0094	0.0041	0.0053
25	0.0095	0.0042	0.0053
26	0.0095	0.0042	0.0053
27	0.0095	0.0042	0.0053
28	0.0095	0.0042	0.0053
29	0.0096	0.0042	0.0054
30	0.0096	0.0042	0.0054
31	0.0096	0.0042	0.0054
32	0.0097	0.0042	0.0054
33	0.0097	0.0043	0.0054
34	0.0097	0.0043	0.0055
35	0.0098	0.0043	0.0055
36	0.0098	0.0043	0.0055
37	0.0098	0.0043	0.0055
38	0.0099	0.0043	0.0055
39	0.0099	0.0044	0.0056
40	0.0099	0.0044	0.0056
41	0.0100	0.0044	0.0056
42	0.0100	0.0044	0.0056
43	0.0100	0.0044	0.0056
44	0.0101	0.0044	0.0056
45	0.0101	0.0044	0.0057
46	0.0101	0.0045	0.0057
47	0.0102	0.0045	0.0057
48	0.0102	0.0045	0.0057
49	0.0103	0.0045	0.0058
50	0.0103	0.0045	0.0058
51	0.0103	0.0045	0.0058
52	0.0104	0.0046	0.0058
53	0.0104	0.0046	0.0058
54	0.0104	0.0046	0.0059
55	0.0105	0.0046	0.0059
56	0.0105	0.0046	0.0059
57	0.0106	0.0046	0.0059
58	0.0106	0.0047	0.0060
59	0.0107	0.0047	0.0060
60	0.0107	0.0047	0.0060

61	0.0108	0.0047	0.0060
62	0.0108	0.0047	0.0060
63	0.0108	0.0048	0.0061
64	0.0109	0.0048	0.0061
65	0.0109	0.0048	0.0061
66	0.0110	0.0048	0.0061
67	0.0110	0.0048	0.0062
68	0.0111	0.0049	0.0062
69	0.0111	0.0049	0.0062
70	0.0111	0.0049	0.0063
71	0.0112	0.0049	0.0063
72	0.0112	0.0049	0.0063
73	0.0113	0.0050	0.0063
74	0.0113	0.0050	0.0064
75	0.0114	0.0050	0.0064
76	0.0114	0.0050	0.0064
77	0.0115	0.0051	0.0065
78	0.0116	0.0051	0.0065
79	0.0116	0.0051	0.0065
80	0.0117	0.0051	0.0065
81	0.0117	0.0052	0.0066
82	0.0118	0.0052	0.0066
83	0.0118	0.0052	0.0066
84	0.0119	0.0052	0.0067
85	0.0120	0.0053	0.0067
86	0.0120	0.0053	0.0067
87	0.0121	0.0053	0.0068
88	0.0121	0.0053	0.0068
89	0.0122	0.0054	0.0068
90	0.0123	0.0054	0.0069
91	0.0123	0.0054	0.0069
92	0.0124	0.0054	0.0069
93	0.0125	0.0055	0.0070
94	0.0125	0.0055	0.0070
95	0.0126	0.0055	0.0071
96	0.0126	0.0056	0.0071
97	0.0127	0.0056	0.0071
98	0.0128	0.0056	0.0072
99	0.0129	0.0057	0.0072
100	0.0129	0.0057	0.0073
101	0.0130	0.0057	0.0073
102	0.0131	0.0057	0.0073
103	0.0132	0.0058	0.0074
104	0.0132	0.0058	0.0074
105	0.0133	0.0059	0.0075
106	0.0134	0.0059	0.0075
107	0.0135	0.0059	0.0076
108	0.0136	0.0060	0.0076
109	0.0137	0.0060	0.0077
110	0.0137	0.0060	0.0077
111	0.0139	0.0061	0.0078
112	0.0139	0.0061	0.0078
113	0.0140	0.0062	0.0079
114	0.0141	0.0062	0.0079
115	0.0142	0.0063	0.0080
116	0.0143	0.0063	0.0080
117	0.0144	0.0063	0.0081
118	0.0145	0.0064	0.0081
119	0.0146	0.0064	0.0082
120	0.0147	0.0065	0.0082
121	0.0149	0.0065	0.0083
122	0.0149	0.0066	0.0084
123	0.0151	0.0066	0.0085
124	0.0152	0.0067	0.0085
125	0.0153	0.0067	0.0086
126	0.0154	0.0068	0.0086
127	0.0156	0.0068	0.0087
128	0.0156	0.0069	0.0088
129	0.0158	0.0069	0.0089
130	0.0159	0.0070	0.0089
131	0.0161	0.0071	0.0090

132	0.0162	0.0071	0.0091
133	0.0164	0.0072	0.0092
134	0.0165	0.0072	0.0092
135	0.0167	0.0073	0.0094
136	0.0168	0.0074	0.0094
137	0.0170	0.0075	0.0095
138	0.0171	0.0075	0.0096
139	0.0173	0.0076	0.0097
140	0.0174	0.0077	0.0098
141	0.0177	0.0078	0.0099
142	0.0178	0.0078	0.0100
143	0.0181	0.0079	0.0101
144	0.0182	0.0080	0.0102
145	0.0166	0.0073	0.0093
146	0.0168	0.0074	0.0094
147	0.0170	0.0075	0.0096
148	0.0172	0.0076	0.0096
149	0.0175	0.0077	0.0098
150	0.0177	0.0078	0.0099
151	0.0180	0.0079	0.0101
152	0.0181	0.0080	0.0102
153	0.0185	0.0081	0.0104
154	0.0187	0.0082	0.0105
155	0.0191	0.0084	0.0107
156	0.0193	0.0085	0.0108
157	0.0197	0.0086	0.0110
158	0.0199	0.0087	0.0111
159	0.0203	0.0089	0.0114
160	0.0206	0.0090	0.0115
161	0.0211	0.0093	0.0118
162	0.0213	0.0094	0.0120
163	0.0219	0.0096	0.0123
164	0.0222	0.0097	0.0124
165	0.0228	0.0100	0.0128
166	0.0231	0.0101	0.0130
167	0.0238	0.0104	0.0133
168	0.0241	0.0106	0.0135
169	0.0285	0.0125	0.0160
170	0.0289	0.0127	0.0162
171	0.0298	0.0131	0.0167
172	0.0303	0.0133	0.0170
173	0.0314	0.0138	0.0176
174	0.0319	0.0140	0.0179
175	0.0332	0.0146	0.0186
176	0.0338	0.0149	0.0190
177	0.0353	0.0155	0.0198
178	0.0361	0.0158	0.0202
179	0.0379	0.0166	0.0212
180	0.0389	0.0171	0.0218
181	0.0411	0.0180	0.0230
182	0.0424	0.0186	0.0238
183	0.0453	0.0199	0.0254
184	0.0470	0.0206	0.0263
185	0.0424	0.0186	0.0238
186	0.0448	0.0197	0.0251
187	0.0508	0.0223	0.0285
188	0.0548	0.0241	0.0307
189	0.0661	0.0290	0.0371
190	0.0746	0.0327	0.0418
191	0.1066	0.0341	0.0725
192	0.1466	0.0341	0.1125
193	0.4587	0.0341	0.4247
194	0.0868	0.0341	0.0528
195	0.0597	0.0262	0.0335
196	0.0476	0.0209	0.0267
197	0.0489	0.0215	0.0274
198	0.0437	0.0192	0.0245
199	0.0399	0.0175	0.0224
200	0.0369	0.0162	0.0207
201	0.0345	0.0152	0.0194
202	0.0325	0.0143	0.0182

203	0.0308	0.0135	0.0173
204	0.0294	0.0129	0.0165
205	0.0245	0.0108	0.0138
206	0.0234	0.0103	0.0131
207	0.0225	0.0099	0.0126
208	0.0216	0.0095	0.0121
209	0.0208	0.0091	0.0117
210	0.0201	0.0088	0.0113
211	0.0195	0.0085	0.0109
212	0.0189	0.0083	0.0106
213	0.0183	0.0080	0.0103
214	0.0178	0.0078	0.0100
215	0.0173	0.0076	0.0097
216	0.0169	0.0074	0.0095
217	0.0183	0.0080	0.0103
218	0.0179	0.0079	0.0101
219	0.0176	0.0077	0.0098
220	0.0172	0.0076	0.0097
221	0.0169	0.0074	0.0095
222	0.0166	0.0073	0.0093
223	0.0163	0.0071	0.0091
224	0.0160	0.0070	0.0090
225	0.0157	0.0069	0.0088
226	0.0155	0.0068	0.0087
227	0.0152	0.0067	0.0085
228	0.0150	0.0066	0.0084
229	0.0148	0.0065	0.0083
230	0.0146	0.0064	0.0082
231	0.0144	0.0063	0.0081
232	0.0142	0.0062	0.0079
233	0.0140	0.0061	0.0078
234	0.0138	0.0061	0.0077
235	0.0136	0.0060	0.0076
236	0.0135	0.0059	0.0075
237	0.0133	0.0058	0.0075
238	0.0131	0.0058	0.0074
239	0.0130	0.0057	0.0073
240	0.0128	0.0056	0.0072
241	0.0127	0.0056	0.0071
242	0.0126	0.0055	0.0070
243	0.0124	0.0055	0.0070
244	0.0123	0.0054	0.0069
245	0.0122	0.0053	0.0068
246	0.0120	0.0053	0.0068
247	0.0119	0.0052	0.0067
248	0.0118	0.0052	0.0066
249	0.0117	0.0051	0.0066
250	0.0116	0.0051	0.0065
251	0.0115	0.0050	0.0064
252	0.0114	0.0050	0.0064
253	0.0113	0.0050	0.0063
254	0.0112	0.0049	0.0063
255	0.0111	0.0049	0.0062
256	0.0110	0.0048	0.0062
257	0.0109	0.0048	0.0061
258	0.0108	0.0047	0.0061
259	0.0107	0.0047	0.0060
260	0.0106	0.0047	0.0060
261	0.0106	0.0046	0.0059
262	0.0105	0.0046	0.0059
263	0.0104	0.0046	0.0058
264	0.0103	0.0045	0.0058
265	0.0102	0.0045	0.0057
266	0.0102	0.0045	0.0057
267	0.0101	0.0044	0.0057
268	0.0100	0.0044	0.0056
269	0.0100	0.0044	0.0056
270	0.0099	0.0043	0.0055
271	0.0098	0.0043	0.0055
272	0.0097	0.0043	0.0055
273	0.0097	0.0043	0.0054

274	0.0096	0.0042	0.0054
275	0.0096	0.0042	0.0054
276	0.0095	0.0042	0.0053
277	0.0094	0.0041	0.0053
278	0.0094	0.0041	0.0053
279	0.0093	0.0041	0.0052
280	0.0093	0.0041	0.0052
281	0.0092	0.0040	0.0052
282	0.0092	0.0040	0.0051
283	0.0091	0.0040	0.0051
284	0.0090	0.0040	0.0051
285	0.0090	0.0039	0.0050
286	0.0089	0.0039	0.0050
287	0.0089	0.0039	0.0050
288	0.0088	0.0039	0.0050

Total soil rain loss = 2.16(In)
Total effective rainfall = 3.25(In)
Peak flow rate in flood hydrograph = 1615.24(CFS)

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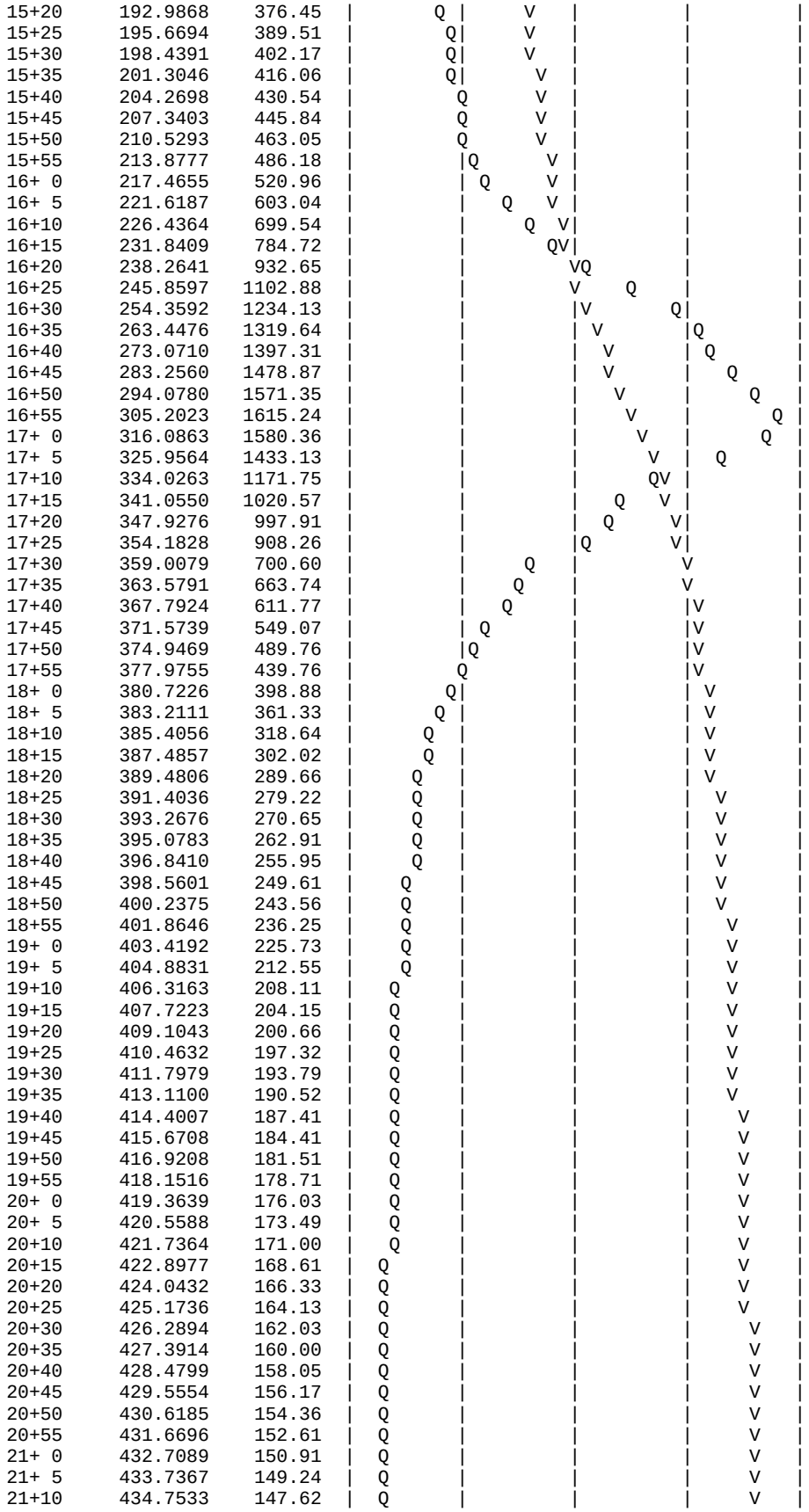
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	425.0	850.0	1275.0	1700.0
0+ 5	0.0039	0.57	Q				
0+10	0.0167	1.86	Q				
0+15	0.0410	3.53	Q				
0+20	0.0849	6.38	Q				
0+25	0.1594	10.81	Q				
0+30	0.2724	16.40	Q				
0+35	0.4283	22.64	Q				
0+40	0.6314	29.48	Q				
0+45	0.8865	37.05	Q				
0+50	1.2011	45.68	VQ				
0+55	1.5803	55.05	VQ				
1+ 0	2.0253	64.62	VQ				
1+ 5	2.5297	73.24	VQ				
1+10	3.0751	79.18	VQ				
1+15	3.6513	83.67	VQ				
1+20	4.2615	88.60	V Q				
1+25	4.9031	93.16	V Q				
1+30	5.5607	95.48	V Q				
1+35	6.2348	97.88	V Q				
1+40	6.9241	100.08	V Q				
1+45	7.6259	101.90	V Q				
1+50	8.3378	103.37	V Q				
1+55	9.0580	104.57	V Q				
2+ 0	9.7851	105.58	V Q				
2+ 5	10.5182	106.44	V Q				
2+10	11.2548	106.96	V Q				
2+15	11.9950	107.47	|VQ				
2+20	12.7387	107.98	|VQ				
2+25	13.4859	108.50	|VQ				
2+30	14.2367	109.01	|VQ				
2+35	14.9910	109.53	|VQ				
2+40	15.7490	110.06	|VQ				
2+45	16.5106	110.58	|VQ				
2+50	17.2758	111.11	|VQ				
2+55	18.0447	111.64	|VQ				
3+ 0	18.8168	112.11	|VQ				
3+ 5	19.5913	112.47	|VQ				
3+10	20.3684	112.83	|VQ				
3+15	21.1479	113.19	|VQ				
3+20	21.9300	113.56	|VQ				
3+25	22.7146	113.93	|VQ				

3+30	23.5019	114.30	VQ			
3+35	24.2917	114.68	Q			
3+40	25.0841	115.06	Q			
3+45	25.8792	115.45	Q			
3+50	26.6770	115.84	Q			
3+55	27.4775	116.23	Q			
4+ 0	28.2808	116.63	Q			
4+ 5	29.0868	117.03	Q			
4+10	29.8955	117.44	Q			
4+15	30.7072	117.85	Q			
4+20	31.5216	118.26	Q			
4+25	32.3389	118.68	Q			
4+30	33.1592	119.10	Q			
4+35	33.9823	119.52	Q			
4+40	34.8084	119.95	Q			
4+45	35.6376	120.39	QV			
4+50	36.4697	120.83	QV			
4+55	37.3049	121.27	QV			
5+ 0	38.1432	121.72	QV			
5+ 5	38.9847	122.18	QV			
5+10	39.8293	122.63	QV			
5+15	40.6771	123.10	QV			
5+20	41.5281	123.57	QV			
5+25	42.3824	124.04	QV			
5+30	43.2399	124.52	QV			
5+35	44.1009	125.01	QV			
5+40	44.9651	125.50	QV			
5+45	45.8329	125.99	QV			
5+50	46.7040	126.49	QV			
5+55	47.5787	127.00	Q V			
6+ 0	48.4569	127.51	QV			
6+ 5	49.3386	128.03	QV			
6+10	50.2240	128.56	QV			
6+15	51.1131	129.09	QV			
6+20	52.0058	129.63	QV			
6+25	52.9023	130.17	QV			
6+30	53.8026	130.72	QV			
6+35	54.7068	131.28	QV			
6+40	55.6148	131.85	QV			
6+45	56.5268	132.42	QV			
6+50	57.4428	133.00	QV			
6+55	58.3628	133.59	QV			
7+ 0	59.2869	134.18	Q V			
7+ 5	60.2151	134.78	Q V			
7+10	61.1476	135.39	Q V			
7+15	62.0843	136.01	Q V			
7+20	63.0253	136.63	Q V			
7+25	63.9707	137.27	Q V			
7+30	64.9205	137.91	Q V			
7+35	65.8748	138.57	Q V			
7+40	66.8336	139.22	Q V			
7+45	67.7971	139.90	Q V			
7+50	68.7652	140.57	Q V			
7+55	69.7381	141.26	Q V			
8+ 0	70.7158	141.96	Q V			
8+ 5	71.6984	142.67	Q V			
8+10	72.6860	143.39	Q V			
8+15	73.6785	144.12	Q V			
8+20	74.6762	144.86	Q V			
8+25	75.6790	145.61	Q V			
8+30	76.6871	146.37	Q V			
8+35	77.7006	147.15	Q V			
8+40	78.7194	147.94	Q V			
8+45	79.7438	148.74	Q V			
8+50	80.7737	149.55	Q V			
8+55	81.8093	150.37	Q V			
9+ 0	82.8507	151.21	Q V			
9+ 5	83.8980	152.06	Q V			
9+10	84.9512	152.93	Q V			
9+15	86.0105	153.81	Q V			
9+20	87.0759	154.70	Q V			

9+25	88.1476	155.61	Q V				
9+30	89.2257	156.54	Q V				
9+35	90.3102	157.48	Q V				
9+40	91.4014	158.44	Q V				
9+45	92.4993	159.41	Q V				
9+50	93.6040	160.40	Q V				
9+55	94.7157	161.42	Q V				
10+ 0	95.8344	162.44	Q V				
10+ 5	96.9604	163.50	Q V				
10+10	98.0938	164.56	Q V				
10+15	99.2346	165.65	Q V				
10+20	100.3831	166.76	Q V				
10+25	101.5394	167.90	Q V				
10+30	102.7037	169.05	Q V				
10+35	103.8760	170.23	Q V				
10+40	105.0566	171.43	Q V				
10+45	106.2457	172.66	Q V				
10+50	107.4434	173.91	Q V				
10+55	108.6500	175.19	Q V				
11+ 0	109.8655	176.49	Q V				
11+ 5	111.0902	177.83	Q V				
11+10	112.3243	179.19	Q V				
11+15	113.5680	180.59	Q V				
11+20	114.8216	182.02	Q V				
11+25	116.0852	183.48	Q V				
11+30	117.3592	184.97	Q V				
11+35	118.6437	186.51	Q V				
11+40	119.9389	188.07	Q V				
11+45	121.2453	189.69	Q V				
11+50	122.5630	191.33	Q V				
11+55	123.8924	193.02	Q V				
12+ 0	125.2337	194.76	Q V				
12+ 5	126.5865	196.42	Q V				
12+10	127.9500	197.98	Q V				
12+15	129.3241	199.52	Q V				
12+20	130.7074	200.86	Q V				
12+25	132.0981	201.94	Q V				
12+30	133.4950	202.82	Q V				
12+35	134.8975	203.65	Q V				
12+40	136.3052	204.40	Q V				
12+45	137.7176	205.08	Q V				
12+50	139.1336	205.61	Q V				
12+55	140.5528	206.06	Q V				
13+ 0	141.9753	206.55	Q V				
13+ 5	143.4032	207.33	Q V				
13+10	144.8407	208.74	Q V				
13+15	146.2908	210.55	Q V				
13+20	147.7534	212.37	Q V				
13+25	149.2299	214.38	Q V				
13+30	150.7240	216.95	Q V				
13+35	152.2368	219.65	Q V				
13+40	153.7691	222.50	Q V				
13+45	155.3227	225.58	Q V				
13+50	156.8989	228.87	Q V				
13+55	158.4993	232.39	Q V				
14+ 0	160.1254	236.10	Q V				
14+ 5	161.7802	240.28	Q V				
14+10	163.4676	245.01	Q V				
14+15	165.1902	250.13	Q V				
14+20	166.9530	255.95	Q V				
14+25	168.7621	262.69	Q V				
14+30	170.6228	270.17	Q V				
14+35	172.5391	278.24	Q V				
14+40	174.5149	286.89	Q V				
14+45	176.5550	296.23	Q V				
14+50	178.6652	306.40	Q V				
14+55	180.8509	317.37	Q V				
15+ 0	183.1164	328.94	Q V				
15+ 5	185.4633	340.77	Q V				
15+10	187.8887	352.17	Q V				
15+15	190.3942	363.79	Q V				



15+20	192.9868	376.45	
15+25	195.6694	389.51	
15+30	198.4391	402.17	
15+35	201.3046	416.06	
15+40	204.2698	430.54	
15+45	207.3403	445.84	
15+50	210.5293	463.05	
15+55	213.8777	486.18	
16+ 0	217.4655	520.96	
16+ 5	221.6187	603.04	
16+10	226.4364	699.54	
16+15	231.8409	784.72	
16+20	238.2641	932.65	
16+25	245.8597	1102.88	
16+30	254.3592	1234.13	
16+35	263.4476	1319.64	
16+40	273.0710	1397.31	
16+45	283.2560	1478.87	
16+50	294.0780	1571.35	
16+55	305.2023	1615.24	
17+ 0	316.0863	1580.36	
17+ 5	325.9564	1433.13	
17+10	334.0263	1171.75	
17+15	341.0550	1020.57	
17+20	347.9276	997.91	
17+25	354.1828	908.26	
17+30	359.0079	700.60	
17+35	363.5791	663.74	
17+40	367.7924	611.77	
17+45	371.5739	549.07	
17+50	374.9469	489.76	
17+55	377.9755	439.76	
18+ 0	380.7226	398.88	
18+ 5	383.2111	361.33	
18+10	385.4056	318.64	
18+15	387.4857	302.02	
18+20	389.4806	289.66	
18+25	391.4036	279.22	
18+30	393.2676	270.65	
18+35	395.0783	262.91	
18+40	396.8410	255.95	
18+45	398.5601	249.61	
18+50	400.2375	243.56	
18+55	401.8646	236.25	
19+ 0	403.4192	225.73	
19+ 5	404.8831	212.55	
19+10	406.3163	208.11	
19+15	407.7223	204.15	
19+20	409.1043	200.66	
19+25	410.4632	197.32	
19+30	411.7979	193.79	
19+35	413.1100	190.52	
19+40	414.4007	187.41	
19+45	415.6708	184.41	
19+50	416.9208	181.51	
19+55	418.1516	178.71	
20+ 0	419.3639	176.03	
20+ 5	420.5588	173.49	
20+10	421.7364	171.00	
20+15	422.8977	168.61	
20+20	424.0432	166.33	
20+25	425.1736	164.13	
20+30	426.2894	162.03	
20+35	427.3914	160.00	
20+40	428.4799	158.05	
20+45	429.5554	156.17	
20+50	430.6185	154.36	
20+55	431.6696	152.61	
21+ 0	432.7089	150.91	
21+ 5	433.7367	149.24	
21+10	434.7533	147.62	

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  21+15     435.7592    146.05  |  Q      |         |         |     V   |
  21+20     436.7546    144.53  |  Q      |         |         |     V   |
  21+25     437.7399    143.06  |  Q      |         |         |      V  |
  21+30     438.7153    141.63  |  Q      |         |         |      V  |
  21+35     439.6811    140.24  |  Q      |         |         |      V  |
  21+40     440.6377    138.89  |  Q      |         |         |      V  |
  21+45     441.5852    137.58  |  Q      |         |         |      V  |
  21+50     442.5239    136.30  |  Q      |         |         |      V  |
  21+55     443.4540    135.06  |  Q      |         |         |      V  |
  22+ 0     444.3758    133.85  |  Q      |         |         |      V  |
  22+ 5     445.2895    132.67  |  Q      |         |         |      V  |
  22+10     446.1952    131.52  |  Q      |         |         |      V  |
  22+15     447.0933    130.39  |  Q      |         |         |      V  |
  22+20     447.9838    129.30  |  Q      |         |         |      V  |
  22+25     448.8669    128.23  |  Q      |         |         |      V  |
  22+30     449.7429    127.19  | Q       |         |         |       V |
  22+35     450.6118    126.17  | Q       |         |         |       V |
  22+40     451.4739    125.18  | Q       |         |         |       V |
  22+45     452.3293    124.20  | Q       |         |         |       V |
  22+50     453.1782    123.25  | Q       |         |         |       V |
  22+55     454.0206    122.32  | Q       |         |         |       V |
  23+ 0     454.8568    121.41  | Q       |         |         |       V |
  23+ 5     455.6869    120.52  | Q       |         |         |       V |
  23+10     456.5109    119.65  | Q       |         |         |       V |
  23+15     457.3291    118.80  | Q       |         |         |       V |
  23+20     458.1415    117.96  | Q       |         |         |       V |
  23+25     458.9483    117.14  | Q       |         |         |       V |
  23+30     459.7495    116.34  | Q       |         |         |       V |
  23+35     460.5453    115.55  | Q       |         |         |       V |
  23+40     461.3358    114.78  | Q       |         |         |        V|
  23+45     462.1211    114.02  | Q       |         |         |        V|
  23+50     462.9012    113.28  | Q       |         |         |        V|
  23+55     463.6764    112.55  | Q       |         |         |        V|
  24+ 0     464.4466    111.83  | Q       |         |         |        V|
  24+ 5     465.2080    110.56  | Q       |         |         |        V|
  24+10     465.9559    108.59  | Q       |         |         |        V|
  24+15     466.6878    106.26  | Q       |         |         |        V|
  24+20     467.3956    102.77  | Q       |         |         |        V|
  24+25     468.0688     97.75  | Q       |         |         |        V|
  24+30     468.6997     91.61  | Q       |         |         |        V|
  24+35     469.2843     84.88  |Q        |         |         |        V|
  24+40     469.8188     77.61  |Q        |         |         |        V|
  24+45     470.2987     69.68  |Q        |         |         |        V|
  24+50     470.7172     60.76  |Q        |         |         |        V|
  24+55     471.0697     51.18  |Q        |         |         |        V|
  25+ 0     471.3553     41.48  Q         |         |         |        V|
  25+ 5     471.5814     32.82  Q         |         |         |        V|
  25+10     471.7666     26.90  Q         |         |         |        V|
  25+15     471.9214     22.48  Q         |         |         |        V|
  25+20     472.0432     17.68  Q         |         |         |        V|
  25+25     472.1345     13.27  Q         |         |         |        V|
  25+30     472.2113     11.14  Q         |         |         |        V|
  25+35     472.2730      8.95  Q         |         |         |        V|
  25+40     472.3211      6.99  Q         |         |         |        V|
  25+45     472.3585      5.43  Q         |         |         |        V|
  25+50     472.3876      4.23  Q         |         |         |        V|
  25+55     472.4104      3.31  Q         |         |         |        V|
  26+ 0     472.4282      2.59  Q         |         |         |        V|
  26+ 5     472.4422      2.03  Q         |         |         |        V|
  26+10     472.4547      1.81  Q         |         |         |        V|
  26+15     472.4659      1.62  Q         |         |         |        V|
  26+20     472.4757      1.43  Q         |         |         |        V|
  26+25     472.4842      1.23  Q         |         |         |        V|
  26+30     472.4914      1.04  Q         |         |         |        V|
  26+35     472.4973      0.85  Q         |         |         |        V|
  26+40     472.5018      0.66  Q         |         |         |        V|
  26+45     472.5051      0.48  Q         |         |         |        V|
  26+50     472.5071      0.29  Q         |         |         |        V|
  26+55     472.5079      0.12  Q         |         |         |         V
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APPENDIX C: PRELIMINARY CHANNEL SIZING CONCRETE LINING

APPENDIX C.1: REACH 1 – WARM CREEK CHANNEL TO TIPPECANOE

Worksheet for Reach 1 - Warm Creek Chnl to Tippecanoe_Conc

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00730	ft/ft
Discharge	1637.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	9.00
0+13.50	0.00
0+36.50	0.00
0+50.00	9.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 9.00)	(0+13.50, 0.00)	0.014
(0+13.50, 0.00)	(0+36.50, 0.00)	0.030
(0+36.50, 0.00)	(0+50.00, 9.00)	0.014

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	4.61	ft
Elevation Range	0.00 to 9.00 ft	
Flow Area	138.00	ft²
Wetted Perimeter	39.63	ft
Hydraulic Radius	3.48	ft
Top Width	36.84	ft
Normal Depth	4.61	ft

Worksheet for Reach 1 - Warm Creek Chnl to Tippecanoe_Conc

Results

Critical Depth		4.83	ft
Critical Slope		0.00619	ft/ft
Velocity		11.86	ft/s
Velocity Head		2.19	ft
Specific Energy		6.80	ft
Froude Number		1.08	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		4.61	ft
Critical Depth		4.83	ft
Channel Slope		0.00730	ft/ft
Critical Slope		0.00619	ft/ft

APPENDIX C.2: REACH 2 –TIPPECANOE TO STERLING

Worksheet for Reach 2 - Tippecanoe to Sterling _Conc

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00730	ft/ft
Discharge	1637.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	9.00
0+13.50	0.00
0+31.50	0.00
0+45.00	9.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 9.00)	(0+13.50, 0.00)	0.014
(0+13.50, 0.00)	(0+31.50, 0.00)	0.030
(0+31.50, 0.00)	(0+45.00, 9.00)	0.014

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.05	ft
Elevation Range	0.00 to 9.00 ft	
Flow Area	129.09	ft²
Wetted Perimeter	36.20	ft
Hydraulic Radius	3.57	ft
Top Width	33.14	ft
Normal Depth	5.05	ft

Worksheet for Reach 2 - Tippecanoe to Sterling _Conc

Results

Critical Depth		5.43	ft
Critical Slope		0.00560	ft/ft
Velocity		12.68	ft/s
Velocity Head		2.50	ft
Specific Energy		7.55	ft
Froude Number		1.13	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		5.05	ft
Critical Depth		5.43	ft
Channel Slope		0.00730	ft/ft
Critical Slope		0.00560	ft/ft

APPENDIX C.3: REACH 3 –STERLING TO VICTORIA

Worksheet for Reach 3 - Sterling to Victoria _Conc

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00750	ft/ft
Discharge	1363.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	8.00
0+12.00	0.00
0+48.00	0.00
0+60.00	8.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 8.00)	(0+12.00, 0.00)	0.014
(0+12.00, 0.00)	(0+48.00, 0.00)	0.030
(0+48.00, 0.00)	(0+60.00, 8.00)	0.014

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	3.40	ft
Elevation Range	0.00 to 8.00 ft	
Flow Area	139.90	ft²
Wetted Perimeter	48.27	ft
Hydraulic Radius	2.90	ft
Top Width	46.21	ft
Normal Depth	3.40	ft

Worksheet for Reach 3 - Sterling to Victoria _Conc

Results

Critical Depth		3.38	ft
Critical Slope		0.00771	ft/ft
Velocity		9.74	ft/s
Velocity Head		1.47	ft
Specific Energy		4.88	ft
Froude Number		0.99	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		3.40	ft
Critical Depth		3.38	ft
Channel Slope		0.00750	ft/ft
Critical Slope		0.00771	ft/ft

APPENDIX D: PRELIMINARY CHANNEL SIZING RIP-RAP LINING

APPENDIX D.1: REACH 1 – WARM CREEK CHANNEL TO TIPPECANOE

Worksheet for Reach 1 - Warm Creek Chnl to Tippecanoe_Rip_Rap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00730	ft/ft
Discharge	1637.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	9.00
0+13.50	0.00
0+36.50	0.00
0+50.00	9.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 9.00)	(0+13.50, 0.00)	0.035
(0+13.50, 0.00)	(0+36.50, 0.00)	0.030
(0+36.50, 0.00)	(0+50.00, 9.00)	0.035

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	5.38	ft
Elevation Range	0.00 to 9.00 ft	
Flow Area	167.27	ft²
Wetted Perimeter	42.41	ft
Hydraulic Radius	3.94	ft
Top Width	39.15	ft
Normal Depth	5.38	ft

Worksheet for Reach 1 - Warm Creek Chnl to Tippecanoe_Rip_Rap

Results

Critical Depth		4.83	ft
Critical Slope		0.01073	ft/ft
Velocity		9.79	ft/s
Velocity Head		1.49	ft
Specific Energy		6.87	ft
Froude Number		0.83	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	5.38	ft
Critical Depth	4.83	ft
Channel Slope	0.00730	ft/ft
Critical Slope	0.01073	ft/ft

APPENDIX D.2: REACH 2 –TIPPECANOE TO STERLING

Worksheet for Reach 2 - Tippecanoe to Sterling _Rip_Rap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00730	ft/ft
Discharge	1637.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	9.00
0+13.50	0.00
0+31.50	0.00
0+45.00	9.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 9.00)	(0+13.50, 0.00)	0.035
(0+13.50, 0.00)	(0+31.50, 0.00)	0.030
(0+31.50, 0.00)	(0+45.00, 9.00)	0.035

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	6.07	ft
Elevation Range	0.00 to 9.00 ft	
Flow Area	164.60	ft²
Wetted Perimeter	39.89	ft
Hydraulic Radius	4.13	ft
Top Width	36.22	ft
Normal Depth	6.07	ft

Worksheet for Reach 2 - Tippecanoe to Sterling _Rip_Rap

Results

Critical Depth		5.43	ft
Critical Slope		0.01106	ft/ft
Velocity		9.95	ft/s
Velocity Head		1.54	ft
Specific Energy		7.61	ft
Froude Number		0.82	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.07	ft
Critical Depth	5.43	ft
Channel Slope	0.00730	ft/ft
Critical Slope	0.01106	ft/ft

APPENDIX D.3: REACH 3 –STERLING TO VICTORIA

Worksheet for Reach 3 - Sterling to Victoria _Rip_Rap

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00750	ft/ft
Discharge	1363.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	8.00
0+12.00	0.00
0+48.00	0.00
0+60.00	8.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 8.00)	(0+12.00, 0.00)	0.035
(0+12.00, 0.00)	(0+48.00, 0.00)	0.030
(0+48.00, 0.00)	(0+60.00, 8.00)	0.035

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	3.73	ft
Elevation Range	0.00 to 8.00 ft	
Flow Area	155.30	ft²
Wetted Perimeter	49.46	ft
Hydraulic Radius	3.14	ft
Top Width	47.20	ft
Normal Depth	3.73	ft

Worksheet for Reach 3 - Sterling to Victoria _Rip_Rap

Results

Critical Depth		3.38	ft
Critical Slope		0.01058	ft/ft
Velocity		8.78	ft/s
Velocity Head		1.20	ft
Specific Energy		4.93	ft
Froude Number		0.85	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth		0.00	ft
Length		0.00	ft
Number Of Steps		0	

GVF Output Data

Upstream Depth		0.00	ft
Profile Description			
Profile Headloss		0.00	ft
Downstream Velocity		Infinity	ft/s
Upstream Velocity		Infinity	ft/s
Normal Depth		3.73	ft
Critical Depth		3.38	ft
Channel Slope		0.00750	ft/ft
Critical Slope		0.01058	ft/ft

EXCERPTS

EXCERPT A: SAN BERNARDINO COUNTY MASTER DRAINAGE PLAN

COMPREHENSIVE STORM DRAIN PLAN NO. 6

FACILITY MAP -- AREA A -- SHEET 1 OF 2

EXISTING FACILITY – ADEQUATE
EXISTING FACILITY – DEFICIENT
PROPOSED FACILITY — 6-00-00 — FACILITY NAME
WATERSHED BOUNDARY — Q100 / TOTAL AREA
DRAINAGE DIVIDE — BASIN

Exponent
Failure Analysis Associates

SCALE 1" = 1600'

6-DR-00
6-DR-08
6-DR-07
6-DR-09
6-LS-03
6-LS-00
6-LS-04
6-LS-05
6-LS-02
6-LS-01
6-DR-03
6-DR-04
6-DR-05
6-DR-06
6-DR-02
6-WA-09
6-WA-11
6-WA-14
6-WA-17
6-WA-10
6-WA-15
6-WA-16
6-WA-00
6-WA-12
6-WA-13
6-WA-07
6-DR-01
6-WA-08
6-WA-05
6-WA-06
6-WA-04
6-WA-03
6-CI-02
6-CI-01
6-CI-00
6-CI-03
6-CI-04
6-WA-02
6-WA-01
16-CI-00

SAN BERNARDINO
DEL ROSA
NORTON
Del Rosa Sch
Pacific High Sch
Jefferson Hunter Sch
Aquinius Sch
Fairview Sch
West Highlands
Barton Sch
Curtis Jr High Sch
Lyman Sch
Bradley Sch
Parkside Sch
St Bernardine Hospital
County Hospital
Mountain View Cemetery
Arrowhead Country Club
Trailer Park
Water Tank
Fire Station
Percolation Basin
Flowthrough Detention Basin Storage=76 Acre-Feet
Flowthrough Detention Basin Storage=113 Acre-Feet
Detention Basin
Heliport
Substation
Well
Redlands Tower
Lake Harden Springs
Twin Creek
East Twin Creek
Little Mill Creek
Mill Creek
Waterman Canyon
Perris Hill
Perris Hill Park
Meadowbrook Park
Harrison Street
Golden Ave
Camino Ave
Mountain Ave
Eureka St
Marshall Blvd
Lynwood Drive
Valencia Ave
Del Rosa Ave
Date St
Cedar Ave
Base Line
Pacific Ave
Fremont St
Waterman Ave
Sterling Ave
Arden Ave
Orange Show Rd
Highland Ave
Grant St
Mill St
Rialto Ave
Kendall Dr
Del Rosa Basin
Percolation Basin
Detention Basin
Water Tank
Well
Trailer Park
Fire Station
Heliport
Substation
Cemetery
Golf Course
Country Club
Hospital
Sch
Park
Creek
Wash
Canyon
Hill
Ave
St
Blvd
Drive
Road
Avenue
Line
Basin
Tank
Tower
Lake
Springs
Gardens
Meadowbrook
Orange Show
Kendall
Arden
Waterman
Sterling
Rialto
Mill
Grant
Highland
Base Line
Pacific
Fremont
Cedar
Date
Lynwood
Marshall
Eureka
Mountain
Golden
Camino
Del Rosa
Valencia
Harrison
Perris Hill
Twin Creek
East Twin Creek
Little Mill Creek
Mill Creek
Waterman Canyon
Meadowbrook Park
Perris Hill Park
Lyman Sch
Bradley Sch
Parkside Sch
Del Rosa Sch
Pacific High Sch
Jefferson Hunter Sch
Aquinius Sch
Fairview Sch
West Highlands
Barton Sch
Curtis Jr High Sch
St Bernardine Hospital
County Hospital
Mountain View Cemetery
Arrowhead Country Club
Trailer Park
Water Tank
Fire Station
Percolation Basin
Flowthrough Detention Basin Storage=76 Acre-Feet
Flowthrough Detention Basin Storage=113 Acre-Feet
Detention Basin
Heliport
Substation
Well
Redlands Tower
Lake Harden Springs

COMPREHENSIVE STORM DRAIN PLAN NO. 6

FACILITY MAP -- AREA A -- SHEET 2 OF 2

EXISTING FACILITY – ADEQUATE
EXISTING FACILITY – DEFICIENT
PROPOSED FACILITY — 6-00-00 — FACILITY NAME
WATERSHED BOUNDARY — Q100 / TOTAL AREA
DRAINAGE DIVIDE — BASIN

Exponent
Failure Analysis Associates

SCALE
1" = 1600'

SAN MANUEL INDIAN RESERVATION

HIGHLAND

PATTON STATE HOSPITAL

ORTON

McKinley Mtn

6-SD-00 6-SD-01 6-SD-02 6-SD-03 6-SD-04 6-SD-05 6-SD-06 6-SD-07 6-SD-08 6-SD-09
6-LS-01 6-LS-02 6-LS-05
6-DR-02 6-DR-05
6-WA-00 6-WA-16 6-WA-19 6-WA-20 6-WA-21 6-WA-22
6-SM-00
6-CI-00 6-CI-04 6-CI-06 6-CI-07 6-CI-08 6-CI-09 6-CI-10 6-CI-11 6-CI-12 6-CI-13 6-CI-14 6-CI-15
6-SB-02

EXCERPT B: NOAA ATLAS 14 RAINFALL VALUES

NOAA Atlas 14, Volume 6, Version 2
Location name: San Bernardino, California, USA*
Latitude: 34.1065°, Longitude: -117.2424°
Elevation: 1103.59 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.103 (0.085-0.125)	0.136 (0.113-0.166)	0.181 (0.150-0.220)	0.218 (0.179-0.268)	0.268 (0.213-0.342)	0.308 (0.240-0.401)	0.350 (0.265-0.466)	0.393 (0.290-0.539)	0.454 (0.320-0.649)	0.502 (0.342-0.744)
10-min	0.147 (0.122-0.179)	0.195 (0.162-0.237)	0.259 (0.215-0.316)	0.312 (0.256-0.383)	0.385 (0.306-0.490)	0.442 (0.344-0.575)	0.501 (0.380-0.668)	0.564 (0.415-0.773)	0.650 (0.459-0.931)	0.719 (0.490-1.07)
15-min	0.178 (0.148-0.216)	0.236 (0.196-0.287)	0.313 (0.260-0.382)	0.377 (0.310-0.464)	0.465 (0.370-0.592)	0.535 (0.415-0.695)	0.606 (0.459-0.808)	0.682 (0.502-0.935)	0.786 (0.555-1.13)	0.870 (0.593-1.29)
30-min	0.268 (0.223-0.326)	0.356 (0.296-0.433)	0.473 (0.392-0.576)	0.569 (0.467-0.700)	0.702 (0.557-0.893)	0.807 (0.627-1.05)	0.915 (0.693-1.22)	1.03 (0.757-1.41)	1.19 (0.837-1.70)	1.31 (0.894-1.95)
60-min	0.396 (0.330-0.481)	0.526 (0.437-0.639)	0.698 (0.578-0.851)	0.840 (0.690-1.03)	1.04 (0.823-1.32)	1.19 (0.925-1.55)	1.35 (1.02-1.80)	1.52 (1.12-2.08)	1.75 (1.24-2.51)	1.94 (1.32-2.87)
2-hr	0.567 (0.471-0.688)	0.734 (0.610-0.892)	0.955 (0.791-1.16)	1.14 (0.933-1.40)	1.38 (1.10-1.76)	1.58 (1.22-2.05)	1.77 (1.34-2.36)	1.98 (1.46-2.71)	2.26 (1.59-3.23)	2.47 (1.69-3.67)
3-hr	0.693 (0.577-0.842)	0.890 (0.739-1.08)	1.15 (0.951-1.40)	1.36 (1.12-1.67)	1.65 (1.31-2.10)	1.87 (1.45-2.43)	2.10 (1.59-2.80)	2.33 (1.72-3.20)	2.65 (1.87-3.80)	2.90 (1.98-4.30)
6-hr	0.963 (0.801-1.17)	1.23 (1.02-1.49)	1.58 (1.31-1.92)	1.86 (1.53-2.29)	2.24 (1.78-2.85)	2.54 (1.97-3.30)	2.84 (2.15-3.79)	3.15 (2.32-4.32)	3.57 (2.52-5.11)	3.89 (2.65-5.77)
12-hr	1.27 (1.06-1.54)	1.63 (1.36-1.99)	2.11 (1.75-2.57)	2.49 (2.05-3.07)	3.02 (2.39-3.84)	3.42 (2.65-4.44)	3.82 (2.90-5.09)	4.24 (3.12-5.81)	4.80 (3.39-6.87)	5.23 (3.56-7.76)
24-hr	1.72 (1.53-1.98)	2.25 (1.99-2.59)	2.93 (2.59-3.39)	3.49 (3.06-4.07)	4.25 (3.60-5.12)	4.83 (4.01-5.94)	5.42 (4.39-6.82)	6.02 (4.75-7.80)	6.84 (5.18-9.23)	7.48 (5.47-10.4)
2-day	2.12 (1.88-2.44)	2.80 (2.48-3.23)	3.71 (3.27-4.29)	4.45 (3.89-5.18)	5.46 (4.62-6.57)	6.24 (5.18-7.67)	7.04 (5.70-8.87)	7.87 (6.20-10.2)	9.00 (6.81-12.1)	9.88 (7.23-13.8)
3-day	2.30 (2.04-2.65)	3.08 (2.72-3.55)	4.11 (3.62-4.75)	4.96 (4.34-5.78)	6.13 (5.19-7.38)	7.04 (5.85-8.66)	7.98 (6.47-10.1)	8.96 (7.07-11.6)	10.3 (7.80-13.9)	11.4 (8.32-15.9)
4-day	2.47 (2.18-2.84)	3.32 (2.94-3.83)	4.47 (3.94-5.17)	5.42 (4.74-6.32)	6.73 (5.70-8.11)	7.76 (6.44-9.55)	8.82 (7.15-11.1)	9.94 (7.83-12.9)	11.5 (8.68-15.5)	12.7 (9.28-17.7)
7-day	2.81 (2.49-3.24)	3.86 (3.41-4.45)	5.26 (4.64-6.09)	6.44 (5.63-7.50)	8.07 (6.83-9.72)	9.35 (7.76-11.5)	10.7 (8.65-13.5)	12.1 (9.53-15.6)	14.0 (10.6-18.9)	15.6 (11.4-21.7)
10-day	3.04 (2.69-3.50)	4.22 (3.73-4.87)	5.80 (5.12-6.71)	7.13 (6.24-8.31)	8.98 (7.61-10.8)	10.4 (8.67-12.8)	12.0 (9.70-15.1)	13.6 (10.7-17.6)	15.8 (12.0-21.3)	17.6 (12.9-24.5)
20-day	3.75 (3.32-4.32)	5.27 (4.66-6.08)	7.33 (6.46-8.48)	9.06 (7.93-10.6)	11.5 (9.74-13.8)	13.4 (11.1-16.5)	15.5 (12.5-19.5)	17.6 (13.9-22.8)	20.6 (15.6-27.8)	23.0 (16.8-32.1)
30-day	4.41 (3.91-5.09)	6.19 (5.48-7.14)	8.62 (7.60-9.97)	10.7 (9.33-12.4)	13.5 (11.5-16.3)	15.8 (13.2-19.5)	18.3 (14.8-23.0)	20.8 (16.4-27.0)	24.4 (18.5-33.0)	27.3 (20.0-38.1)
45-day	5.31 (4.70-6.12)	7.36 (6.51-8.49)	10.2 (8.97-11.8)	12.6 (11.0-14.6)	15.9 (13.5-19.2)	18.6 (15.5-22.9)	21.5 (17.4-27.0)	24.5 (19.3-31.7)	28.7 (21.8-38.8)	32.2 (23.5-44.9)
60-day	6.25 (5.54-7.21)	8.54 (7.56-9.86)	11.7 (10.3-13.5)	14.3 (12.6-16.7)	18.1 (15.4-21.8)	21.2 (17.6-26.0)	24.4 (19.7-30.7)	27.8 (21.9-36.0)	32.6 (24.7-44.0)	36.5 (26.7-50.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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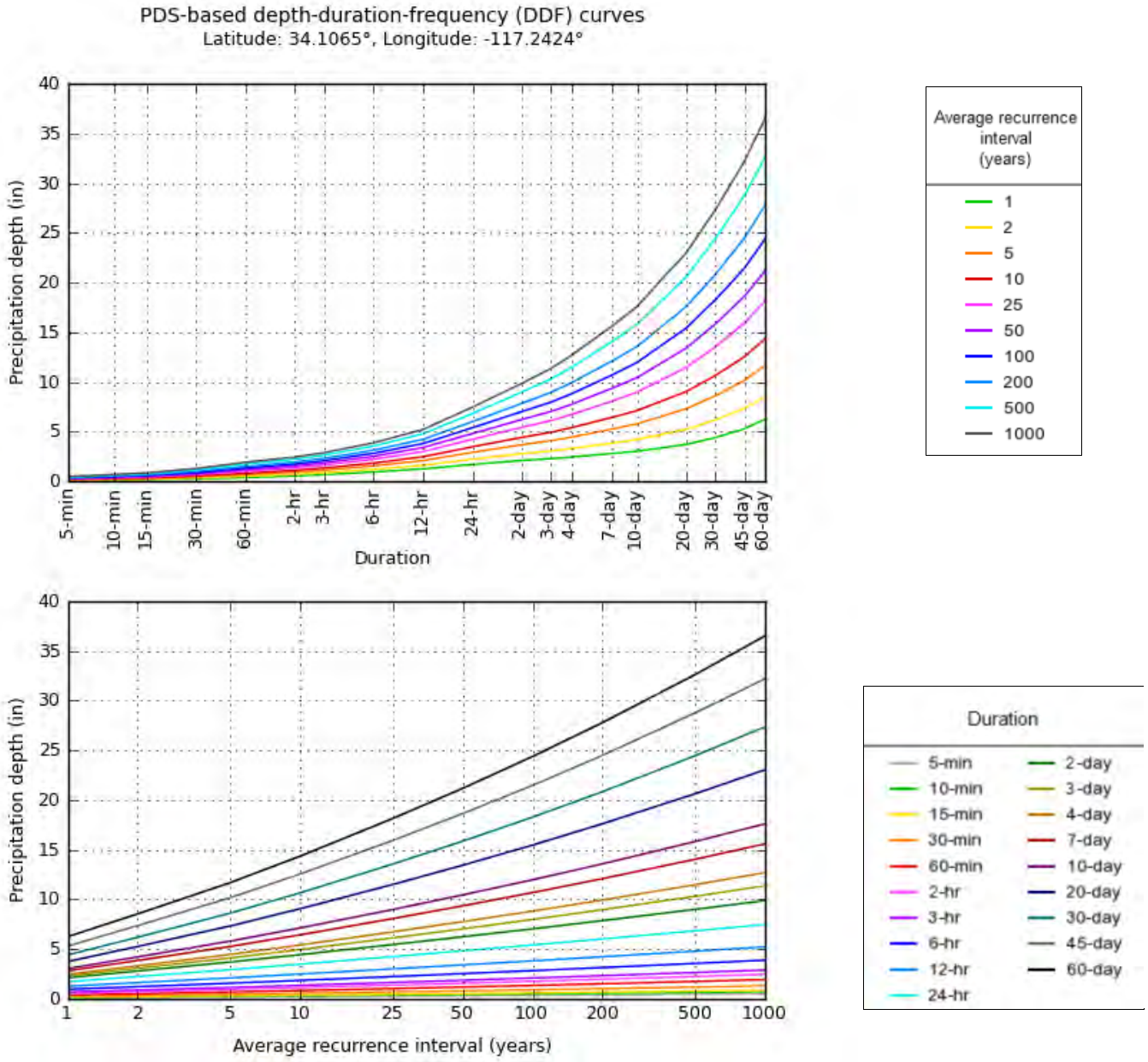
PF graphical



NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Apr 16 17:11:09 2020

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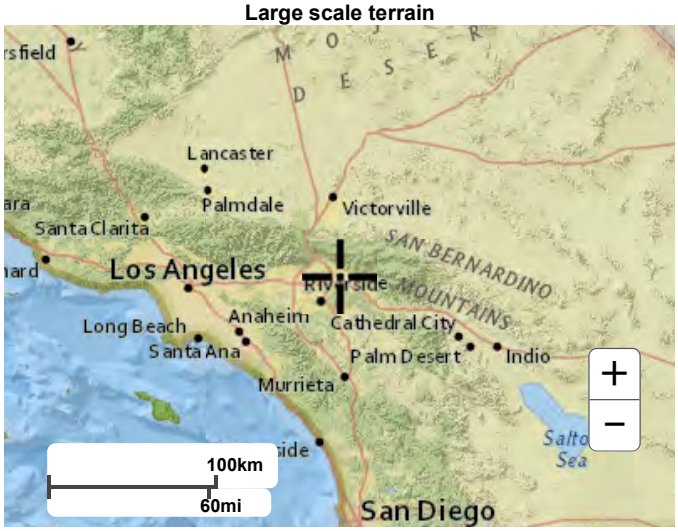
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map

Large scale aerial

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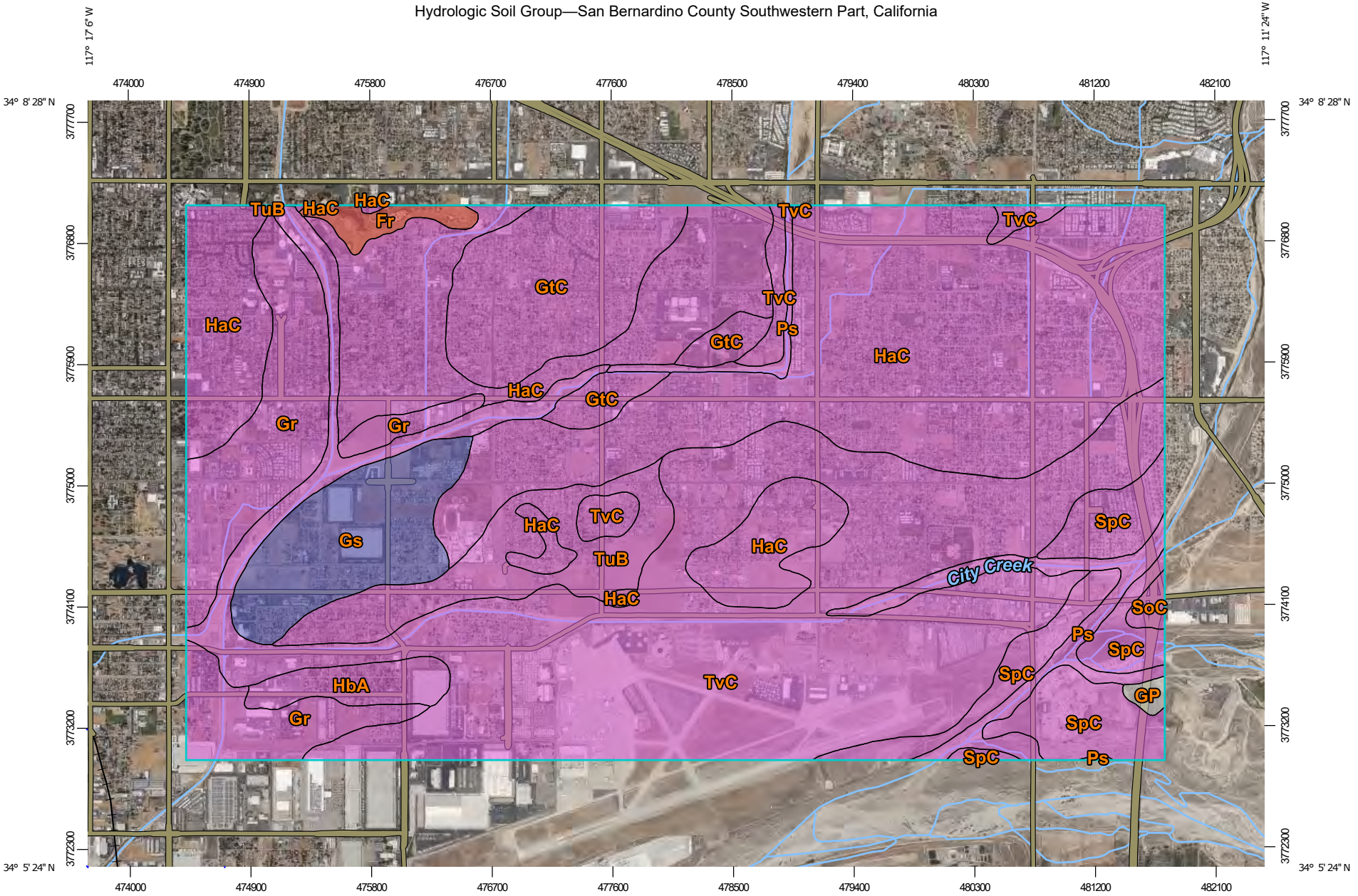
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

EXCERPT C: NRCS SOILS MAP



Map Scale: 1:40,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 500 1000 2000 3000

Feet: 0 1500 3000 6000 9000

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 11, Sep 16, 2019

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

Date(s) aerial images were photographed: Apr 1, 2018—Jun 30, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Fr	Friant-Rock outcrop complex	D	54.5	0.7%
GP	Quarries and Pits soils		15.0	0.2%
Gr	Grangeville fine sandy loam, warm MAAT, MLRA 19	A	572.6	7.7%
Gs	Grangeville fine sandy loam, saline-alkali	B	350.8	4.7%
GtC	Greenfield sandy loam, 2 to 9 percent slopes	A	504.2	6.8%
HaC	Hanford coarse sandy loam, 2 to 9 percent slopes	A	2,594.0	34.8%
HbA	Hanford sandy loam, 0 to 2 percent slopes	A	102.5	1.4%
Ps	Psamments, Fluvents and Frequently flooded soils	A	190.3	2.6%
SoC	Soboba gravelly loamy sand, 0 to 9 percent slopes	A	19.7	0.3%
SpC	Soboba stony loamy sand, 2 to 9 percent slopes	A	424.1	5.7%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	A	308.3	4.1%
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	A	2,326.4	31.2%
Totals for Area of Interest			**7,462.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

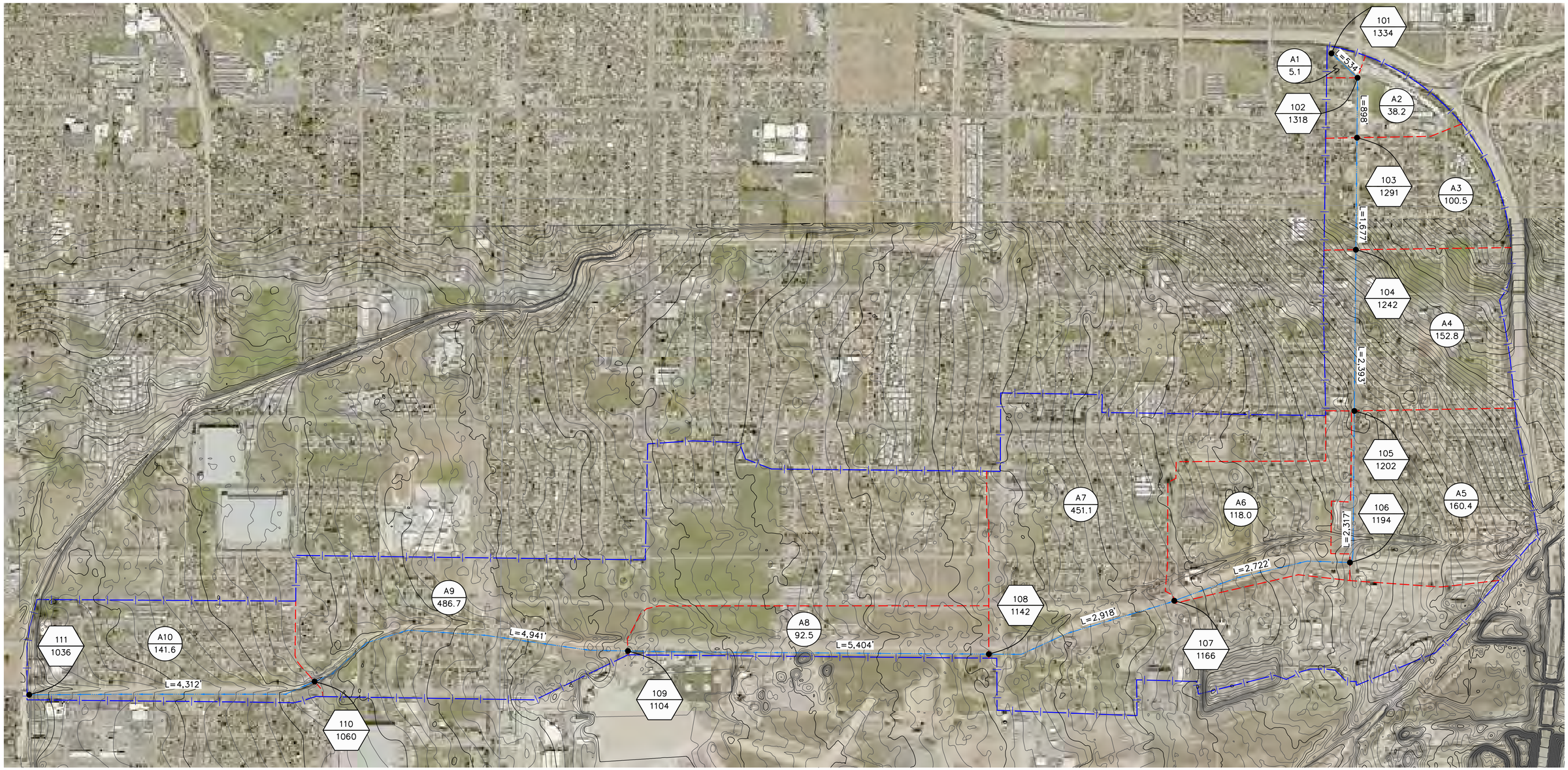
EXHIBITS

EXHIBIT A: ULTIMATE CONDITION OFFSITE RATIONAL METHOD HYDROLOGY MAP

IVDA 3RD AND 6TH STREET SPECIFIC PLAN

COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

TRIBUTARY WATERSHED BOUNDARY



LEGEND:

X.X / X.X	NODE/CONCENTRATION POINT — FLOWLINE ELEVATION
XXXX.X	APPROXIMATE INVERT ELEVATION
XXX / X.X	SUB AREA — ACRES
L=XXX'	FLOW DISTANCE
	FLOW PATH
	WATERSHED SUB-BOUNDARY
	WATERSHED BOUNDARY

N

GRAPHIC SCALE

700' 0 350' 700' 1,400'

1" = 700'

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EXHIBIT "A"

3RD AND 6TH SP

TRIBUTARY WATERSHED BOUNDARY

Drawing Name: G:\754.01.17\Engineering\Hydrology_Plan\Exhibits\Exhibit A - Tributary Watershed Boundary.dwg
Last Opened: Apr 14, 2020 - 2:19pm by swilson

EXHIBIT B: LAND USE MAP

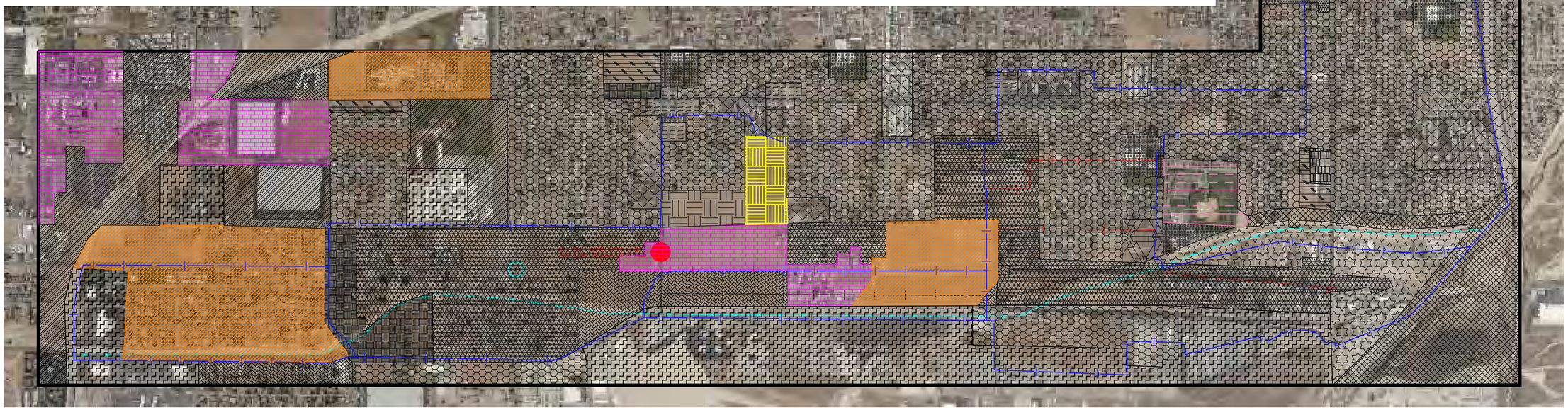
CITY CREEK BY-PASS CHANNEL

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

LAND USE MAP

LEGEND:

- SAN BERNARDINO – RS, RESIDENTIAL SUBURBAN
- SAN BERNARDINO – RM, RESIDENTIAL MEDIUM
- SAN BERNARDINO – RMH, RESIDENTIAL MEDIUM HIGH
- SAN BERNARDINO – CG–1, COMMERCIAL GENERAL
- SAN BERNARDINO – CH, COMMERCIAL HEAVY
- SAN BERNARDINO – OIP, OFFICE INDUSTRIAL PARK
- SAN BERNARDINO – IL, INDUSTRIAL LIGHT
- SAN BERNARDINO – PF, PUBLIC FACILITIES
- SAN BERNARDINO – SP–AC, SPECIFIC PLAN ALLIANCE CALIFRONIA
- HIGHLAND – LOW DENSITY RES.
- HIGHLAND – MEDIUM DENSITY RESIDENTIAL
- HIGHLAND – HIGH DENSITY RES. SPECIAL
- HIGHLAND – PLANNED DEVELOPMENT
- HIGHLAND – GENERAL COMMERCIAL
- HIGHLAND – NEIGHBORHOOD COMMERCIAL
- HIGHLAND – PLANNED COMMERCIAL
- HIGHLAND – MIXED USE
- HIGHLAND – OFFICE PROFESSIONAL
- HIGHLAND – BUSINESS PARK
- HIGHAND – INDUSTRIAL
- HIGHLAND – PUBLIC/INSTITUTIONAL
- HIGHLAND – PARKS
- HIGHLAND – OPEN SPACE
- HIGHLAND – HISTORIC VILLAGE DISTRICT



N

GRAPHIC SCALE

600' 0 300' 600' 1,200'

1" = 600'

JLC Engineering & Consulting, Inc.

36263 CALLE DE LOBO
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EXHIBIT "B"

CITY CREEK BY-PASS CHANNEL

LAND USE MAP

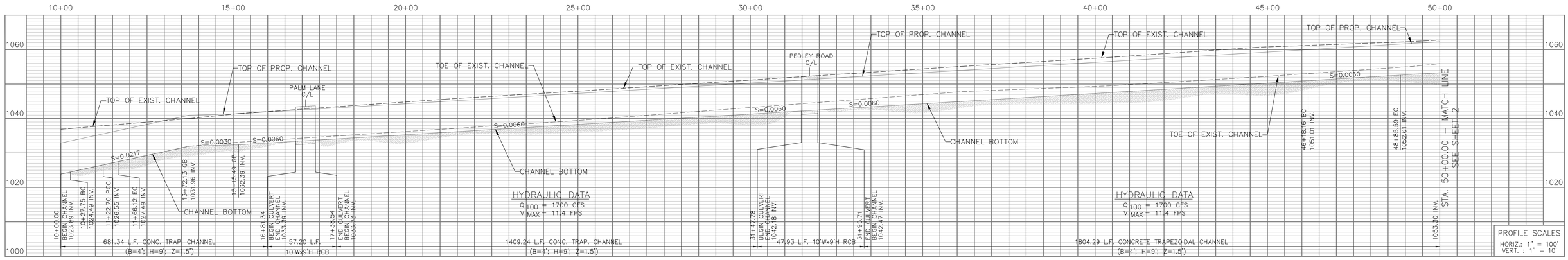
Drawing Name: G:\254.01\Engineering\Hydrology_Plan\Exhibits\Exhibit B_Land Use.dwg
Last Opened: Apr 20, 2020 – 3:54pm by joe

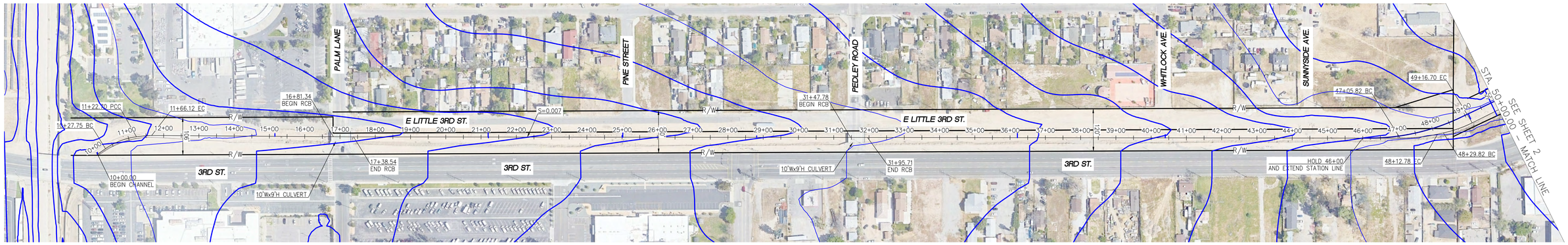
EXHIBIT C: CITY CREEK BY-PASS CHANNEL PRELIMINARY DESIGN

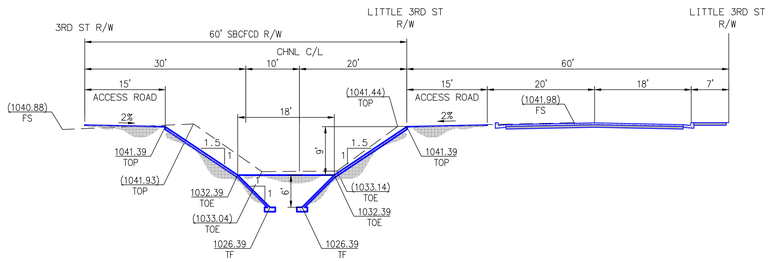
CITY CREEK

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

CHANNEL ALTERNATIVES







CONCRETE CHANNEL DETAIL
SECTION • STA. 15+15.49
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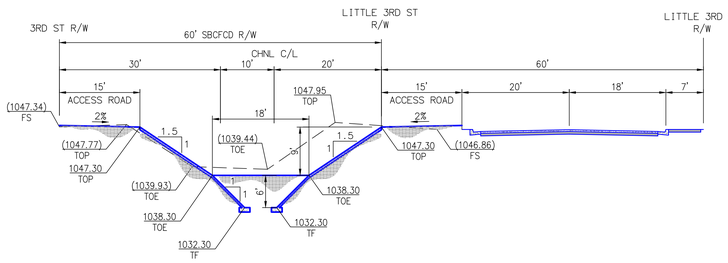

CONCRETE CHANNEL DETAIL
SECTION • STA. 25+00.01
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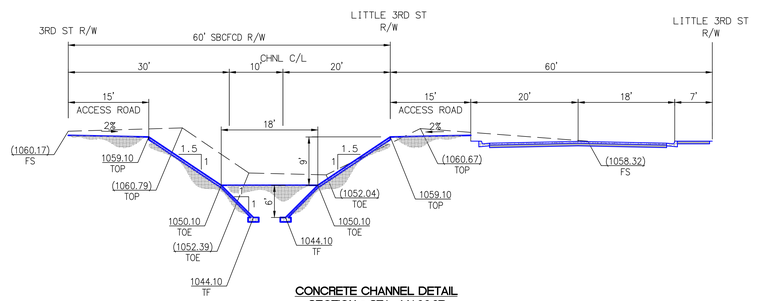

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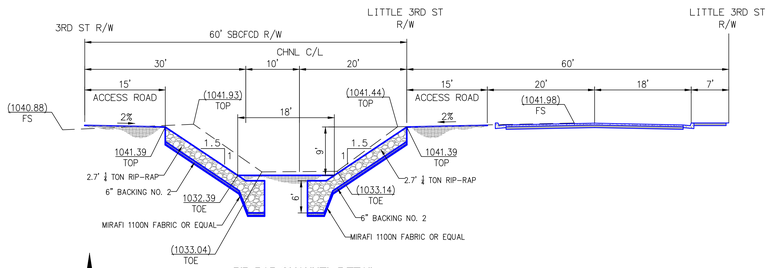
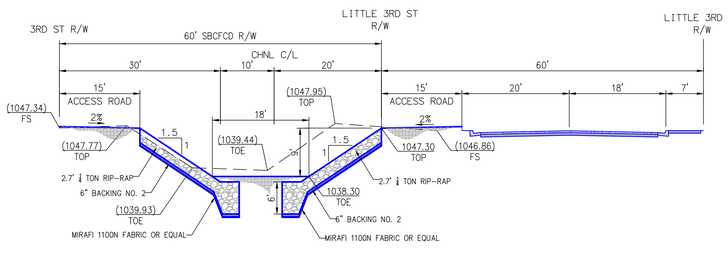


RIP-RAP CHANNEL DETAIL
SECTION • STA. 15+15.49
SCALE: 1"=10'



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SECTION • STA. 25+00.01
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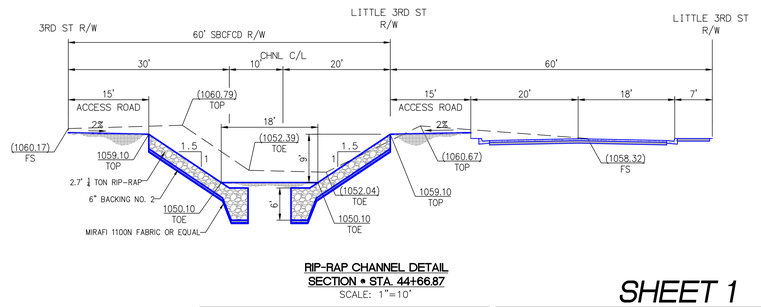

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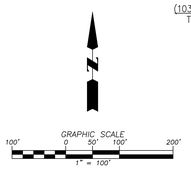

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Last Opened: Oct 22, 2019 - 4:36pm by MattI

SHEET 1

CITY CREEK

CHANNEL ALTERNATIVES

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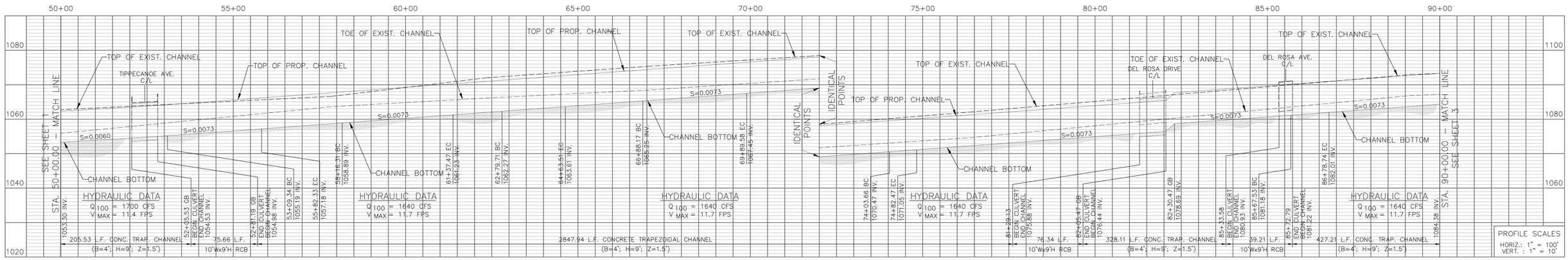
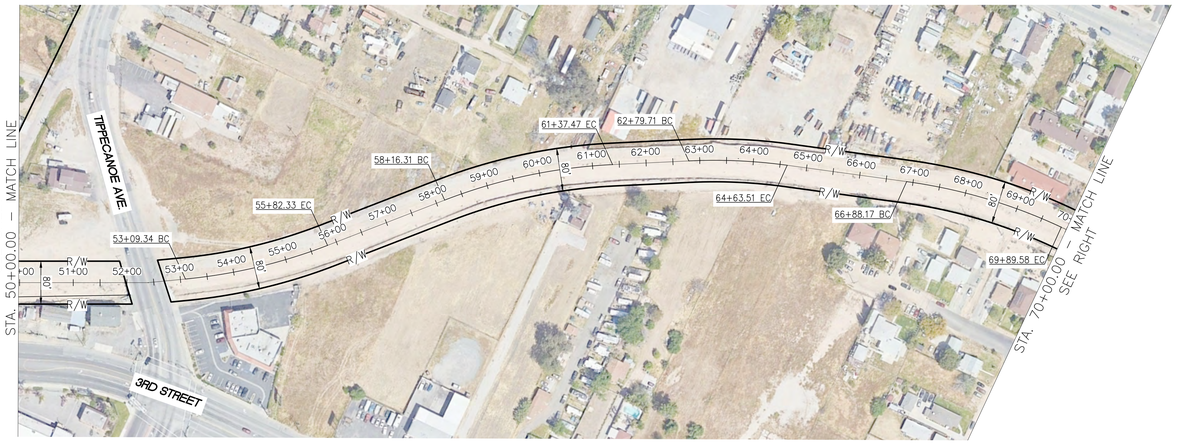
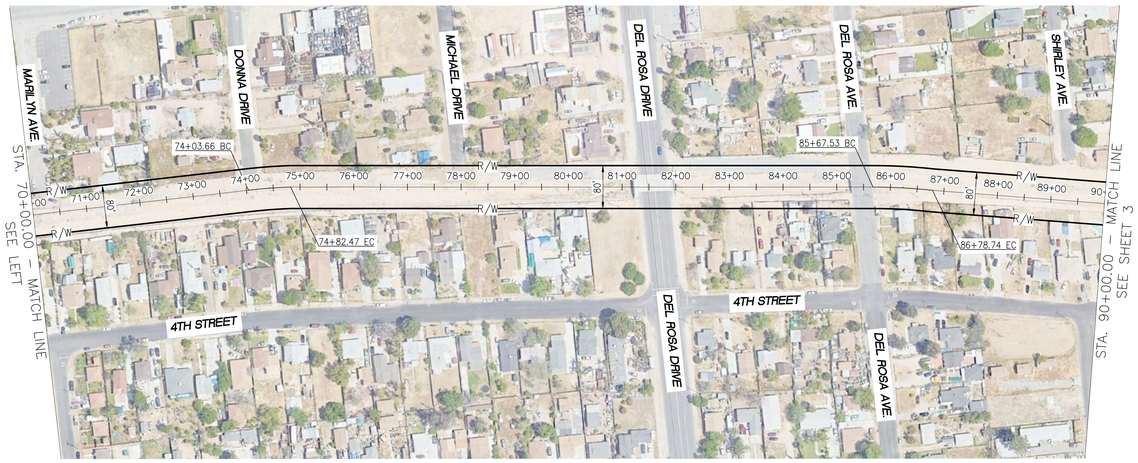
CITY CREEK

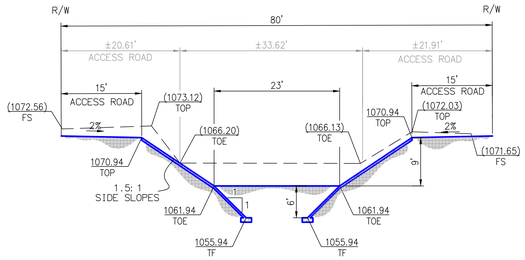
IN THE CITY OF SAN BERNARDINO, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA

CHANNEL ALTERNATIVES









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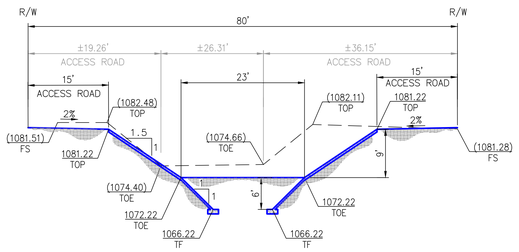

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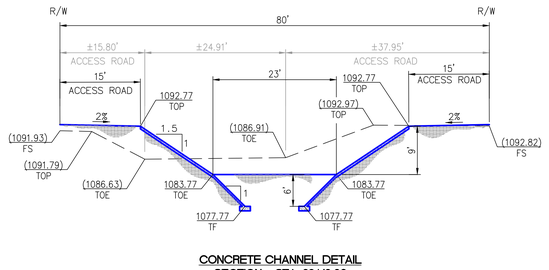

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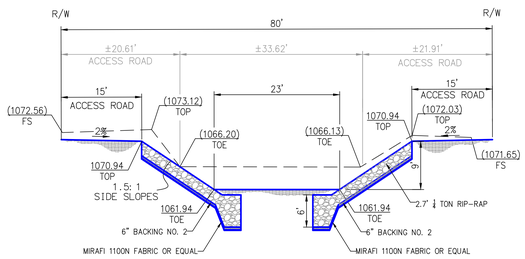

RIP-RAP CHANNEL DETAIL
SECTION • STA. 62+34.45
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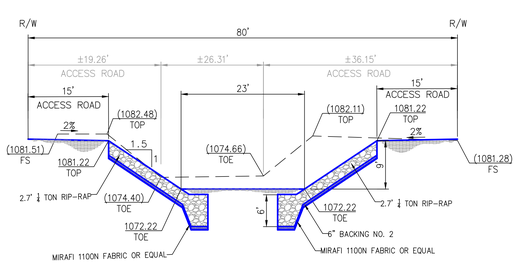

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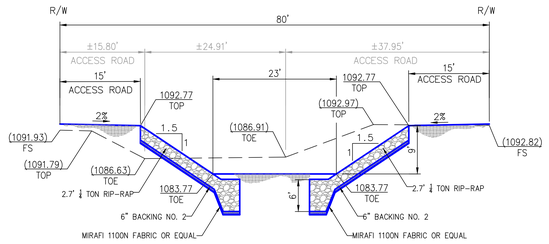

RIP-RAP CHANNEL DETAIL
SECTION • STA. 89+19.60
SCALE: 1"=10'

GRAPHIC SCALE
100' 0 50' 100' 200'
1" = 100'

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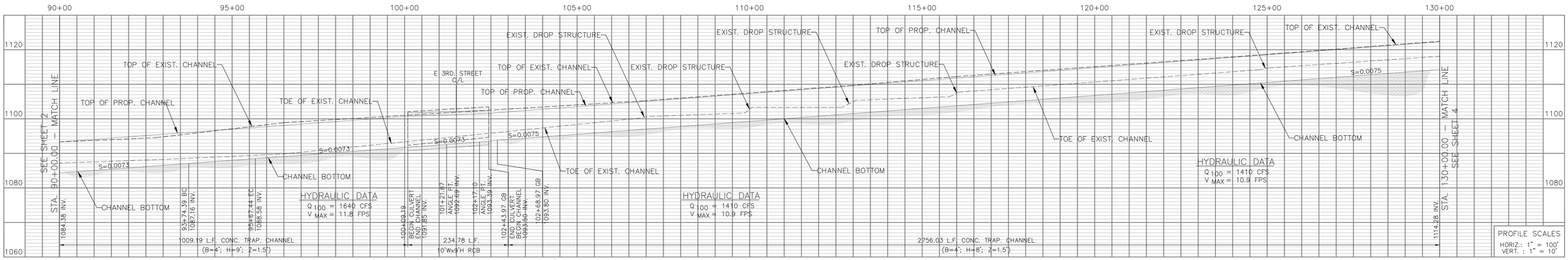
SHEET 2
CITY CREEK
CHANNEL ALTERNATIVES

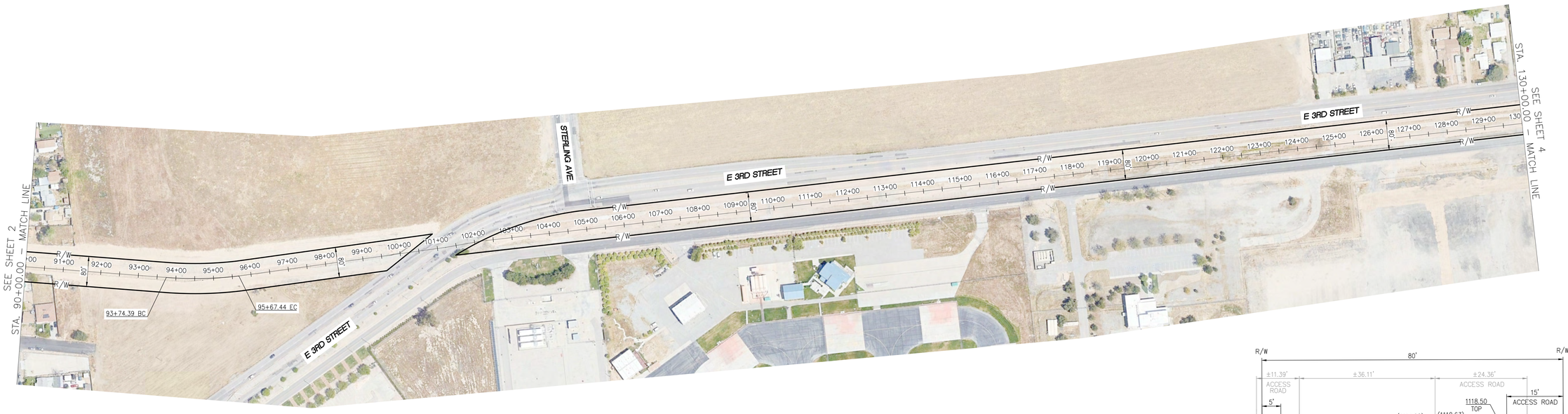
Drawing Name: G:\254.01\7\Channel Alternatives sheet 02.dwg
Last Opened: Oct 22, 2019 - 5:05pm by MattT

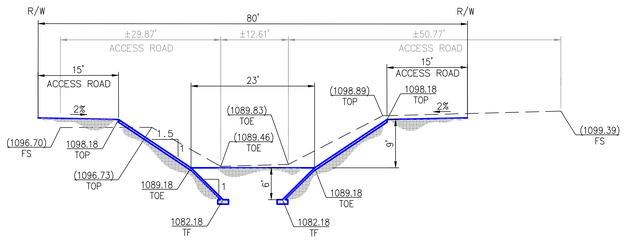
CITY CREEK

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

CHANNEL ALTERNATIVES







CONCRETE CHANNEL DETAIL
SECTION • STA. 96+49.39
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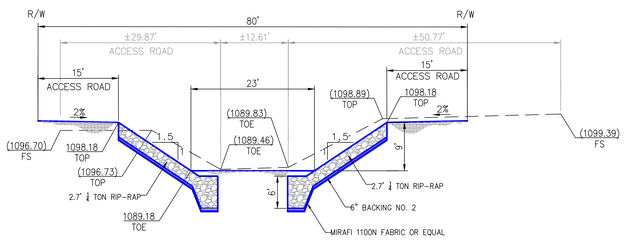

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SECTION • STA. 96+49.39
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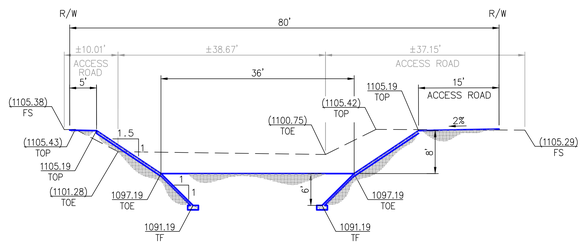

CONCRETE CHANNEL DETAIL
SECTION • STA. 107+20.39
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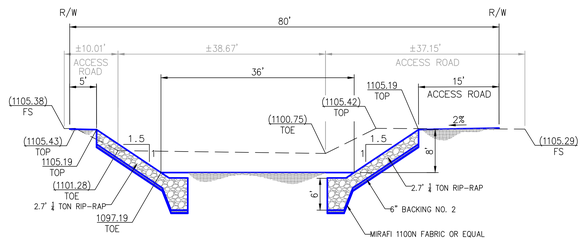

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SECTION • STA. 107+20.39
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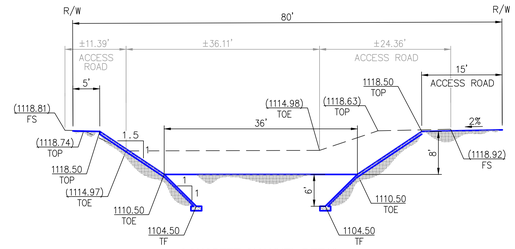

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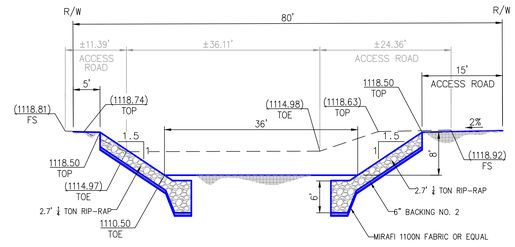

RIP-RAP CHANNEL DETAIL
SECTION • STA. 124+95.01
SCALE: 1"=10'

GRAPHIC SCALE
100' 0 50' 100' 200'
1" = 100'

JLC Engineering & Consulting, Inc.
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MURRIETA, CA 92562
PH. 951.304.9552 FAX 951.304.3568

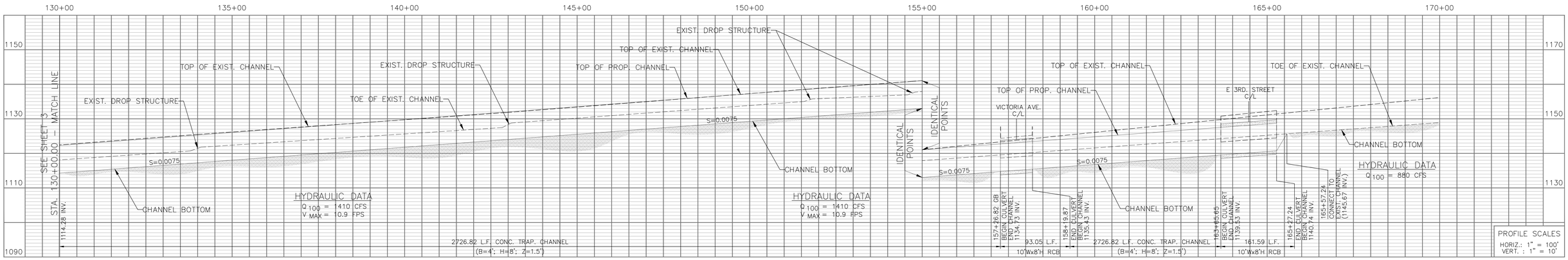
SHEET 3
CITY CREEK
CHANNEL ALTERNATIVES

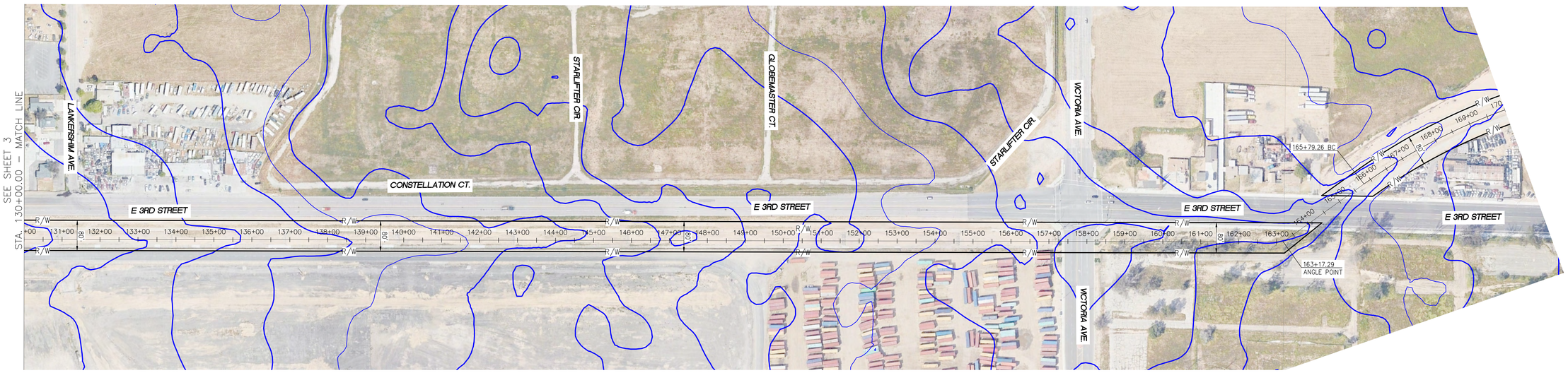
Drawing Name: G:\254.01\7\Channel Alternatives sheet 03.dwg
Last Opened: Oct 22, 2019 - 5:10pm by MatT

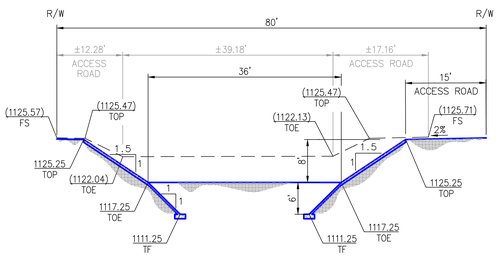
CITY CREEK

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

CHANNEL ALTERNATIVES







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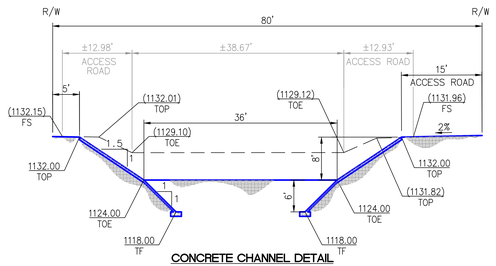

CONCRETE CHANNEL DETAIL
SECTION • STA. 142+95.97
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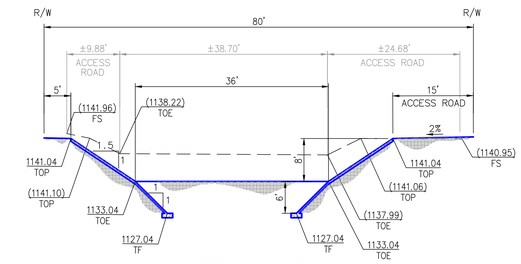

CONCRETE CHANNEL DETAIL
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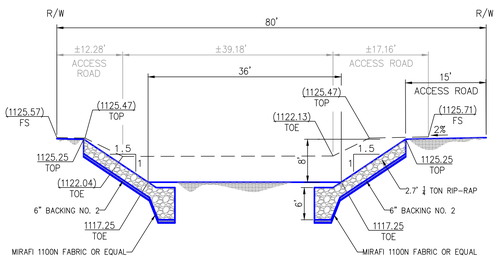
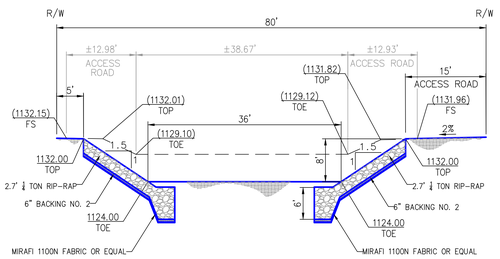
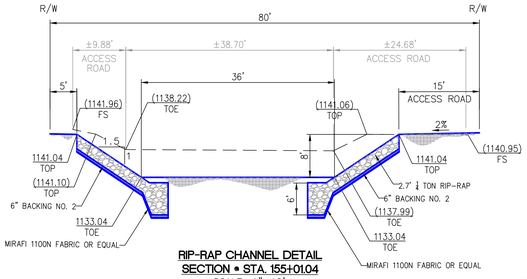


RIP-RAP CHANNEL DETAIL
SECTION • STA. 133+95.80
SCALE: 1"=10'



RIP-RAP CHANNEL DETAIL
SECTION • STA. 142+95.97
SCALE: 1"=10'



RIP-RAP CHANNEL DETAIL
SECTION • STA. 155+01.04
SCALE: 1"=10'

GRAPHIC SCALE
100' 0 50' 100' 200'
1" = 100'

SHEET 4

CITY CREEK

CHANNEL ALTERNATIVES

JLC Engineering & Consulting, Inc.
41660 IVY STREET, SUITE A
MURRIETA, CA 92562
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Drawing Name: G:\254.01.17\Channel Alternatives sheet 04.dwg
Last Opened: Oct 22, 2019 - 8:03pm by MattT